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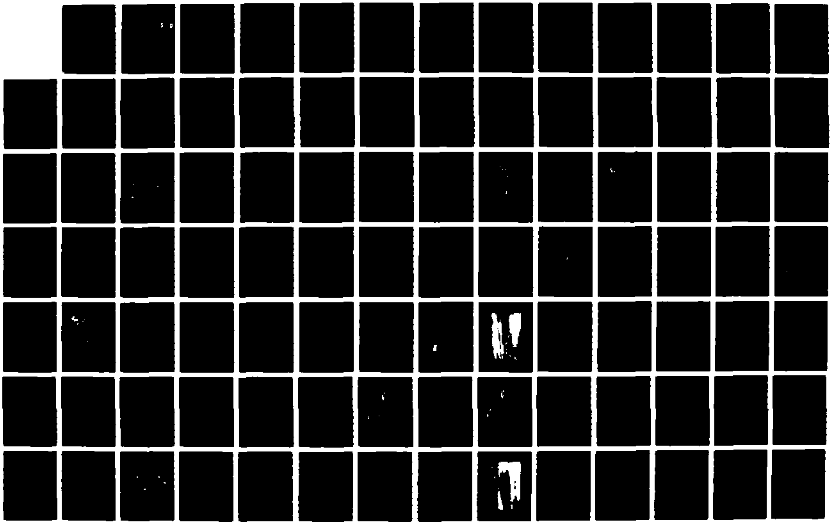

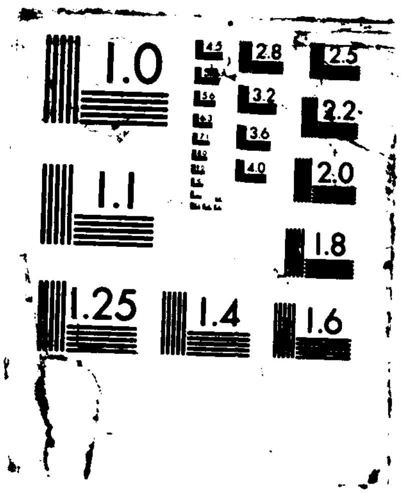
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INSTALLATION RESTORATION PROGRAM
PHASE II--CONFIRMATION/QUANTIFICATION

STAGE 1

Final Report

for

AIR FORCE PLANT 6, COBB COUNTY, GA.

U.S. AIR FORCE
OCCUPATIONAL AND ENVIRONMENTAL HEALTH LABORATORY
Brooks Air Force Base, Tex.

August 1986

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A Phase II, Stage 1 Installation Restoration Program was conducted for Air Force Plant 6, a Government-owned, contractor-operated facility run by Lockheed-Georgia Co. The objective of this study is to confirm the existence of potential contaminants at former and current disposal and storage sites identified by a Phase I Records Search and by Lockheed-Georgia Co.-sponsored environmental site assessments. Sixteen sites were investigated, including past and current landfills; the industrial waste treatment facility area; trichloroethylene (TCE), sodium dichromate, and fuel gas spill areas; the flightline area, and specific areas of contamination within the industrial facility. (Keywords)

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INSTALLATION RESTORATION PROGRAM

PHASE II--CONFIRMATION/QUANTIFICATION

Stage 1

AIR FORCE PLANT 6
COBB COUNTY, GA

ENVIRONMENTAL SCIENCE AND ENGINEERING, INC.
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August 1986

Final (May 1984 - August 1985)

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This report has been prepared for the United States Air Force by Environmental Science and Engineering, Inc., for the purpose of aiding in the Implementation of the Air Force Installation Restoration Program. It is not an endorsement of any product. The views expressed herein are those of the contractor and do not necessarily reflect the official views of the publishing agency, the United States Air Force, or the Department of Defense.

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19. ABSTRACT Continued)

Six additional monitoring wells were installed and water quality and soil samples collected and analyzed for various screening parameters, including total organic carbon (TOC), total organic halogens (TOX), oil and grease, pH, and specific conductance. More than 20 reports of past site investigations conducted under Lockheed-Georgia Co. sponsorship have been reviewed and data integrated into this assessment.

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PREFACE

This report describes the Phase II, Stage 1 Installation Restoration Program (IRP) conducted at Air Force Plant 6, Cobb County, Ga., which is a Government-owned, contractor-operated facility run by Lockheed-Georgia Co. The work was performed from February 1985 to August 1985 by personnel from Environmental Science and Engineering, Inc. (ESE) under U.S. Air Force (USAF) Contract No. F33615-84-D-4401, Order 7, Proposed Modification 2. Law Engineering Co. provided the well drilling services for the study. The contract was monitored by personnel from the USAF Occupational and Environmental Health Laboratory (USAFOEHL) of the Aerospace Medical Division located at Brooks Air Force Base, San Antonio, Tex. Key contractor personnel included C.R. Neff, P.E. (Field Project Manager), D.E. Bruderly, P.E. (Report Project Manager), T.L. Cross, P.E. (Subcontractor Project Manager), T.A. Brislin (Project Coordinator/ Engineer), M.T. Park (Quality Assurance Supervisor), M.S. Geden (Field Team Leader), C.A. Spiers, P.G. (Site Hydrogeologist), K.J. Seefried, P.E. (Project Engineer), and E.A. Knauft (Document Coordinator).

The ESE project team wishes to express its gratitude for the assistance provided by Major George New (USAFOEHL); Mr. Ken Warren, Mr. Joseph Caldwell, and Mr. Russell Ovrevik (AFSC Plant Representative Office); and Mr. James Lucas, Mr. Clifford Griffin, and Ms. Della A. Ridley of the Lockheed-Georgia Co.

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EXECUTIVE SUMMARY

The Phase II, Stage 1 Installation Restoration Program (IRP) Confirmation/Quantification Survey for Air Force Plant 6, Cobb County, Ga., included investigation of 16 sites with suspected environmental contamination due to spills and disposal of hazardous wastes and materials. Twelve sites were identified in the Phase I survey, and four additional sites were identified by Lockheed-Georgia Co. Since many of these sites were located within a single drainage area, ESE grouped them into five zones for presentation and analysis of data.

1. The Industrial Waste Land Disposal Zone (Zone 1) contains three sites that have been used for many years for disposal of solid waste, industrial wastes, and dewatered-sewage sludge.
2. The Industrial Facilities, Active Landfill, and Stormwater Retention Basin No. 2 Zone (Zone 2) encompasses four sites that include the Active Landfill, the recent trichloroethylene (TCE) spill, the Bldg. B-96 and empty drum storage/recycle complex, and Stormwater Retention Basin No. 2.
3. The B-58 Wing Tank Seal Test Facility Zone (Zone 3) has one site.
4. The Industrial Waste Treatment Facility (Zone 4) has been the principal industrial waste treatment plant at Air Force Plant 6. This area contains two sites.
5. The C-5 Flightline Zone (Zone 5) encompasses six sites which are principally associated with fuel spillage leaks, solvent spills, and the spill of sodium dichromate-treated water.

A limited field investigation was conducted by ESE at sites within Zone 2 and Zone 5. Lockheed-Georgia Co. is conducting investigations at a site in Zone 4 and is considering studies in other zones. ESE installed six monitoring wells and sampled for the screening parameters [total organic halogens (TOX), total organic carbon (TOC), pH, specific conductance, and oil and grease] as well as volatile organic

hydrocarbons [U.S. Environmental Protection Agency (EPA) Method 601] and chromium. Soil samples were collected and analyzed by the extraction procedure (EP) toxicity test method for chromium and petroleum hydrocarbons as outlined in Table 1. Reports prepared by contractors to Lockheed-Georgia Co. were reviewed and data evaluated to determine the potential for migration of contaminants known to exist at these sites.

Results from the screening tests were used to determine if contamination existed in the shallow aquifer. Contaminants exceeding National Interim Primary Drinking Water Regulations (NIPDWR), National Secondary Drinking Water Regulations (NSDWR), or EPA criteria for the protection of freshwater aquatic life and human health were found at the ground-water-monitoring wells at three sites. The potential deterioration of ground water quality from organic compounds was determined to be significant at 12 sites due to relatively high levels reported in water and soil samples.

Based on the results, which indicated the presence or absence of contaminants in the shallow ground water and soil samples collected, recommendations were made for no additional action at 1 site, to perform additional analyses at 15 sites to confirm/quantify any contaminants, and to implement mitigative measures at 3 sites. A summary of recommendations, including sampling locations and parameters to be analyzed, is presented in Table 2. A composite of all sites on Air Force Plant 6 and Dobbins Air Force Base (DAFB) is shown in Fig. 1. ESE recommends that a comprehensive program to address contamination at both facilities be developed due to the number of sites on Air Force Plant 6 which are potential sources of contamination to Big Lake and Little Lake.

Table 1. Summary of ESE Sampling and Analyses for Air Force Plant 6 Phase II, Stage 1 Survey

Site No.	Zone	Site Description	Sample Locations	Scope of Work
G1	1	Surface Impoundment	None	Review past investigations.
G2	2	Active Landfill	Install and sample 1 monitoring well	TOC, TOX, oil and grease, pH, specific conductivity, water temperature, EPA Method 601 analytes.
G3	1	Past Landfill	None	Review past investigations.
G4	1	Sanitary Wastewater Treatment Plant (WWTP) Sludge Disposal Area	None	Review past investigations.
G5	2	Stormwater Retention Basin No. 2	Install and sample 1 monitoring well	Review past investigations. TOC, TOX, oil and grease, pH, specific conductivity, temperature, EPA Method 601 analytes.
G6	4	B-10 Aeration Basin	None	Review past investigations.
G7	5	Position 65—C-5 Wash Rack Ponds	None	Review/analyze data from past investigations.
G8	2	Bldg. B-96 Complex	None	Review/analyze data from past investigations.
G9	2	TCE Spill at B-76	None	Review/analyze data from past investigations.
G10	4	JP-5 Fuel Spill No. 2	None	Review/analyze data from past investigations.
G11	5	JP-5 Fuel Spill No. 1	Collect and analyze soil sample	Percent moisture petroleum hydrocarbons. Review/analyze data from past investigations.
G12	5	Position 71—Sodium Dichromate Spill	Install and sample 4 monitoring wells	TOC, TOX, oil and grease, pH, specific conductivity, water temperature, total chromium.
			Collect and analyze 3 soil samples	EP toxicity test for chromium.

Table 1. Summary of ESE Sampling and Analyses for Air Force Plant 6 Phase II, Stage 1 Survey (Continued, Page 2 of 2)

Site No.	Zone	Site Description	Sample Locations	Sample Analyses
G13	5	Position 58—Fuel/ Defuel Station	None	Review past investigations.
G14	5	Position 19—Fuel/ Defuel Station [Aviation Gasoline (AVGAS) Storage]	None	Review past investigations.
G15	3	B-58 Wing Tank Seal Test Facility	None	Review past investigations.
G16	5	B-104 Gas Pump Station	None	Review past investigations.

Note: Sites G1 through G12—Identified during Phase I.
Sites G13 through G16—Sites identified after completion of Phase I Report.

Source: ESE, 1985.

Table 2 Recommendations from Phase II, Stage I Investigation

Site No.	Site Description	Base Neutral Extractables	pH	Specific Conductivity	EPA Method 601 Halocarbon Analytes	EPA Method 602 Aliphatic/Aromatics	PCBs	Heavy Metals	Total Phenol	TOX/TOC	Soil Gas	Ionic Tracer Study	EP Toxicity	Oil and Grease	Category	Recommendations	Rationale
	ZONE 1 INDUSTRIAL WASTE LAND DISPOSAL														2		
G1 G3 G4	Surface Impoundment, Past Landfill, and Sanitary WWTP Sludge Disposal Area														2 2 2	Development of Master Plan; detailed ground and surface water quality survey to identify effects on potential receptors and relative contributions of individual sources. Recommend soil gas testing; additional monitoring wells, including bedrock wells located offsite; and fate and effect survey of streams as needed and development of environmental data base management system.	Confirmed superimposed contamination from at least three separate sources (G1, G3, and G4); heavy metals and organics confirmed in shallow and bedrock wells; organic RCRA-regulated hazardous waste disposal unit; site required to be monitored, upgraded to RCRA standards, or closed.
	Source Survey	X	X	X	X	X					X						
	Monitoring Wells and Inactive Potable Water Supply Wells	X (at selected wells)	X	X	X	X	X	X	X	X							
	Past Landfill Soil Borings	X			X	X	X		X	X			X			Characterize boundaries and hazardous constituents in Past Landfill by geophysics and confirmation boring and testing.	Boundaries of landfill are not known.
	Unnamed Stream	X	X	X	X	X	X	X	X	X		X				Confirmation survey is required to determine whether offsite migration of chlorinated organics is occurring.	Existing data are not conclusive.
	Sanitary WWTP Sludge															Additional waste characterization is not needed for the WWTP sludge; based on review of all past analytical data.	Based on previous EP toxicity tests, the sludge is not classified as a hazardous waste. High contaminations of lead and chromium are present, however, but are not leachable based on EP Toxicity test results.
	ZONE 2 INDUSTRIAL FACILITIES, ACTIVE LANDFILL, AND STORMWATER RETENTION BASIN NO. 2														2		
G7	Active Landfill Monitor Wells Semi Annual	X	X	X	X		X	X		X		X			2	Additional monitoring is suggested due to confirmation of TCE spill plume underneath the landfill extending to stormwater basin and future potential of organic leachate from past disposal practice of solvents and oils. This monitoring should be coordinated with a Master Plan for this area.	TCE and other minor traces of organics plus high conductivity has been detected warranting additional water quality monitoring.
G5	Stormwater Retention Basin No. 2														2	Additional monitoring is mandated by detection of organics upgradient and the residual infiltration from the TCE spill. Installation of offsite monitoring wells and a water quality program should be implemented to ascertain extent of any offsite migration of contaminants. Surface influent/effluent samples should be collected in association with any NPDES permitting from this basin. Aeration should continue as a volatile organic removal process.	Confirmation of organics, particularly TCE found in upgradient drainage monitoring wells and minor tracesh in surface water, requires periodic monitoring of but ground water and surface water. Due to the documented past history of TCE and other organic spills, plus confirmed organic contamination in the upgradient monitoring wells from three separate sources, a detailed water quality monitoring program both on and offsite is warranted.
	a Surface Water Samples/ Influent/Effluent	X	X	X	X	X	X	X	X	X	X						
	b Ground Water Monitoring Wells	X	X	X	X	X	X	X	X	X	X						

Table 2. Recommendations from Phase II, Stage 1 Investigation (Continued, Page 2 of 3)

Site No.	Site Description	Base Neutral Extractables	pH	Specific Conductivity	EPA Method 601 Halocarbon Analytes	EPA Method 602 Aliphatic/Aromatics	PCBs	Total Lead	Total Phenol	TOX/TOC	Soil Gas	Ionic Tracer Study	EP Toxicity	Oil and Grease	Category	Recommendations	Rationale
G8	B-96 Complex Monitor Wells	X	X	X	X	X	X	X	X	X	X		X		2	Due to the extremely large unexpected TCE concentration, additional hydrogeological investigation is required, establishing additional monitoring wells and a field investigation of the Drum Storage Area adjacent to B-96L is suggested utilizing OVA and soil gas surveys.	Due to the extremely high TCE concentration of 38,000 ug/l and detection of other organics, additional monitoring and hydrogeological evaluation is required to determine the source of contamination.
G9	TCE Spill at B-76 Monitor Wells	X	X	X	X	X	X			X	X				2	Additional monitoring is required at all wells in the identified plume zone due to the past TCE spill and additional organic contamination.	Confirmed organic contamination has been detected in many of the monitoring wells.
ZONE 3 B-58 WING TANK SEAL TEST FACILITY															2		
G15	B-58		X	X	X	X	X				X			X	2	Install shallow and bedrock monitoring wells downgradient. If possible, install wells across South Cobb Dr. to detect any offsite migration of contamination. Soil gas testing can be used to identify source and define extent of subsurface contamination.	Hydrogeological conditions are not defined. High concentrations of TCA in MW7 indicates a undefined contamination source exists with potential to migrate off DAFB property onto public property across South Cobb Dr.
ZONE 4 - INDUSTRIAL WASTE TREATMENT FACILITY															2		
G6	B-10 Aeration Basin														2	Development of Master Plan for closure of site. Additional water quality analyses are required to determine the contaminants from all possible sources, B-10 Aeration Basin, Catch Basin, and underdrain since the drainage gradient is towards Big Lake. Additional wells and sampling to determine extent of subsurface contamination and migration offsite.	Organic contamination has been confirmed in the sediments of the B-10 Aeration Basin, adjacent monitor wells, and the underdrain system. Organic contaminants from spillage and stormwater runoff collect in the Catch Basin which has an overflow weir discharge into a storm sewer draining to Big Lake.
	• Monitoring Wells	X	X	X	X	X	X		X	X	X		X				
	• Catch Basin	X	X	X	X	X	X		X	X	X		X				
	• Underdrain	X	X	X	X	X	X		X	X	X		X				
	• Tributary to Big Lake	X	X	X	X	X	X	X	X	X	X	X	X				
G10	JP Fuel Spill No. 2 (Truck Fuel Farm) Monitor Wells														3	Site G10 should be incorporated into the G6 monitoring program. Periodic monitoring for fuel leaks should be performed. Soil sampling to confirm suspected low levels of hydrocarbons.	No evidence of contamination from this fuel spill was found. Records and previous investigations report that 90 percent of fuel was recovered.
	Semiannual		X	X	X	X		X						X			
	Monthly		X	X							X			X			

Table 2. Recommendations from Phase IIa Investigation (Continued, Page 3 of 3)

Site No.	Site Description	Base Neutral Extractables	pH	Specific Conductivity	EPA Method 601 Halocarbon Analytes	EPA Method 602 Aliphatic/Aromatics	PCBs	Total Lead	Total Phenol	TOX/TOC	Soil Gas	Ionic Tracer Study	EP Toxicity	Oil and Grease	Category	Recommendations	Rationale
ZONE 5 C-5 FLIGHTLINE ZONE															2	Recommend closure. All water should be pumped to the IWTF for processing.	Ponds are unlined with confirmed organic contamination, particularly of methylene chloride. These ponds will require remedial action as a RCRA regulated hazardous waste disposal unit.
G7	Position 65 C-5 Wash Racks		X	X	X	X	X	X			X			X	2	Additional monitoring required for RCRA should be sufficient.	
G11	JP-5 Fuel Spill No. 1						N O N E								2	No further action or monitoring is required.	Soil samples indicated minor presence of petroleum hydrocarbons.
G17	Sodium Dichromate Spill-Position 71 (Wells and Surface Water Samples)														2	No further action or monitoring is required for sodium dichromate. Ground water monitoring and soil gas survey should be performed to determine extent of organic contamination from spills or solvent usage. Surface water sample in the drainageway by MW GM12-4 should be collected during a high flow event and tested for organics.	All four monitoring well samples were well below the 0.5 mg/l chromium drinking water MCL and all soil samples were negative for EP toxicity chromium. Organics, TOX, and high conductivity were detected in monitoring wells in the drainageway.
	Semi Annual	X	X	X	X		X	X		X	X			X			
G13	Fuel/Defuel Station-Position 58 (Wells and Surface Water Samples)														2	All wells in the area should be inspected monthly for evidence of fuel or organic contamination. Semi-annual samples of selected wells for EPA Method 601/602 analyte to determine extent of contamination. Hydrostatic testing was performed in the interim to determine if a leak is present based on ESR's recommendations.	No current indication of migrating organic contamination. Organic contamination was confirmed in one well but concentrations have decreased with time.
	Monthly		X	X						X	X			X			
	Semi Annual		X	X	X	X								X			
G14	Fuel/Defuel Station Position 19 (Wells and Surface Water Samples)														2	Inspection and quarterly monitoring of existing wells should occur. Drainageway surface water sampled semi-annually for organics. The source of solvent contamination should be located.	A fuel leakage/spillage problem is evident and confirmed by increasing levels of organic contamination in MW18. Extent of contamination is not known.
	Quarterly		X	X						X	X			X			
	Semi Annual		X	X	X	X								X			
G16	B-104 Gas Pump Areas Investigation (Wells)														2	Additional hydrogeological investigation is required to locate the source(s) of organic contamination. Soil gas sampling may be applicable. Additional monitoring and expanded set of analytes is required.	Isolated pockets of organic contamination have been identified. The source(s) of contamination are unknown. Additional monitoring/geohydrological investigation required to determine source and extent of contamination.
	Monthly		X	X			X			X	X			X			
	Semi Annual		X		X	X	X			X				X			

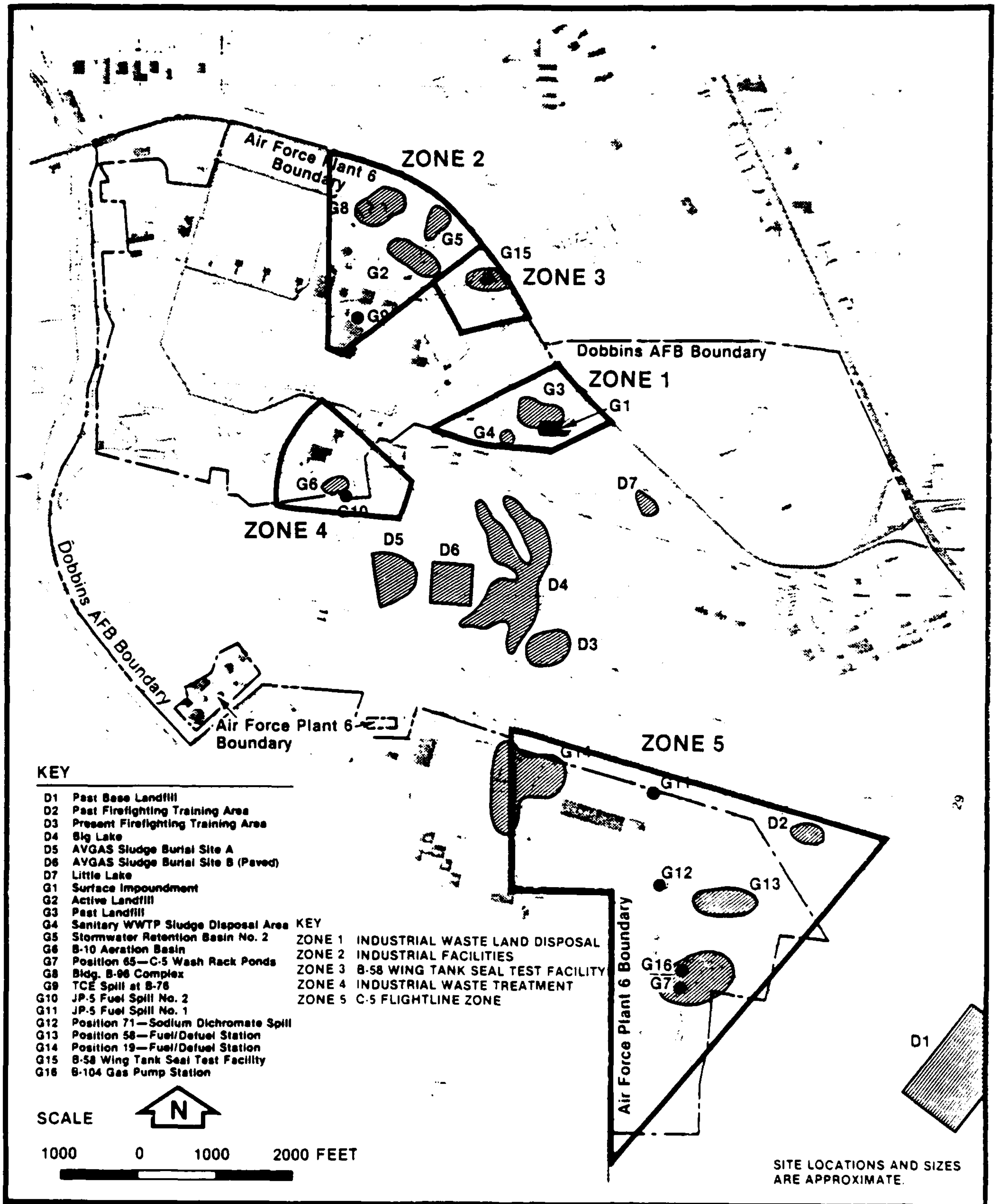

Figure 1
LOCATION MAP OF IDENTIFIED DISPOSAL AND SPILL SITES ON DAFB AND AIR FORCE PLANT 6
SOURCES: CH2M HILL, 1984; ESE, 1985.

INSTALLATION RESTORATION PROGRAM
Air Force Plant 6

1.0 INTRODUCTION

1.1 PROGRAM BACKGROUND

This report describes Phase II, Stage 1 of the Installation Restoration Program (IRP) for Government-owned, contractor-operated (GOCO) Air Force Plant 6, Cobb County, Ga. Phase II pertains to the confirmation and quantification of suspected contamination at former hazardous materials/waste storage or disposal sites.

Due to its primary mission, the U.S. Air Force (USAF) has long been engaged in operations dealing with toxic and hazardous materials. Federal, state, and local governments have developed regulations requiring that disposers identify the locations and contents of disposal sites and take action to eliminate the hazards in an environmentally responsible manner. The primary Federal legislation governing disposal of hazardous waste is the Resource Conservation and Recovery Act (RCRA) of 1976, as amended. Under Sec. 6003 of the Act, Federal agencies are directed to assist the U.S. Environmental Protection Agency (EPA), and, under Sec. 3012, state agencies are required to inventory past disposal sites and make the information available to the requesting agencies. To ensure compliance with these hazardous waste regulations, the Department of Defense (DOD) developed the IRP. The current DOD IRP policy is contained in Defense Environmental Quality Program Policy Memorandum (DEQPPM) 81-5, dated Dec. 11, 1981, and implemented by USAF message dated Jan. 21, 1982. DEQPPM 81-5 reissued and amplified all previous directives and memoranda on the IRP. DOD policy is to identify and fully evaluate suspected problems associated with contamination due to improper use, storage, and disposal of toxic and/or hazardous materials and to control hazards to health and welfare that resulted from these past operations. The IRP provides the basis for response actions on USAF installations pursuant to the provisions of the Comprehensive

Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, as clarified by Executive Order 12316.

The IRP has been divided into the following phases:

Phase I--Initial Assessment/Records Search
Phase II--Confirmation and Quantification
Phase III--Technology Base Development
Phase IV--Operations/Remedial Actions

Phase I, Initial Assessment/Records Search, is designed to identify possible hazardous-waste-contaminated sites and potential problems that may result in contaminant migration from the installation. CH2M Hill was retained on Aug. 17, 1983, to conduct the Phase I investigation at Air Force Plant 6, Cobb County, Ga. (see Fig. 1.1-1 for location) with funds provided by the Aeronautical Systems Division (ASD). This records search was completed in March 1984.

Phase II of the IRP addresses the confirmation and quantification of the extent and magnitude of contaminant migration from sites identified in Phase I. Phase II, Stage 1 consists of a preliminary survey to confirm or rule out the presence and/or migration of contaminants. If the Phase II, Stage 1 investigation confirms the presence and/or migration of contaminants, then Phase II, Stage 2 field work would be conducted to determine the extent and magnitude of the contaminant migration.

Environmental Science and Engineering, Inc. (ESE) in conjunction with Law Engineering Co. (Law) conducted a contamination assessment at Air Force Plant 6 under Phase II, Stage 1 of the DOD IRP of former waste disposal and/or storage sites. The study was performed in response to the findings of the IRP Phase I Records Search, which indicated the potential for contaminant migration from 12 sites. After completion of the Records Search, four other sites identified by contractors for Lockheed-Georgia Co. were evaluated and are included in this report.

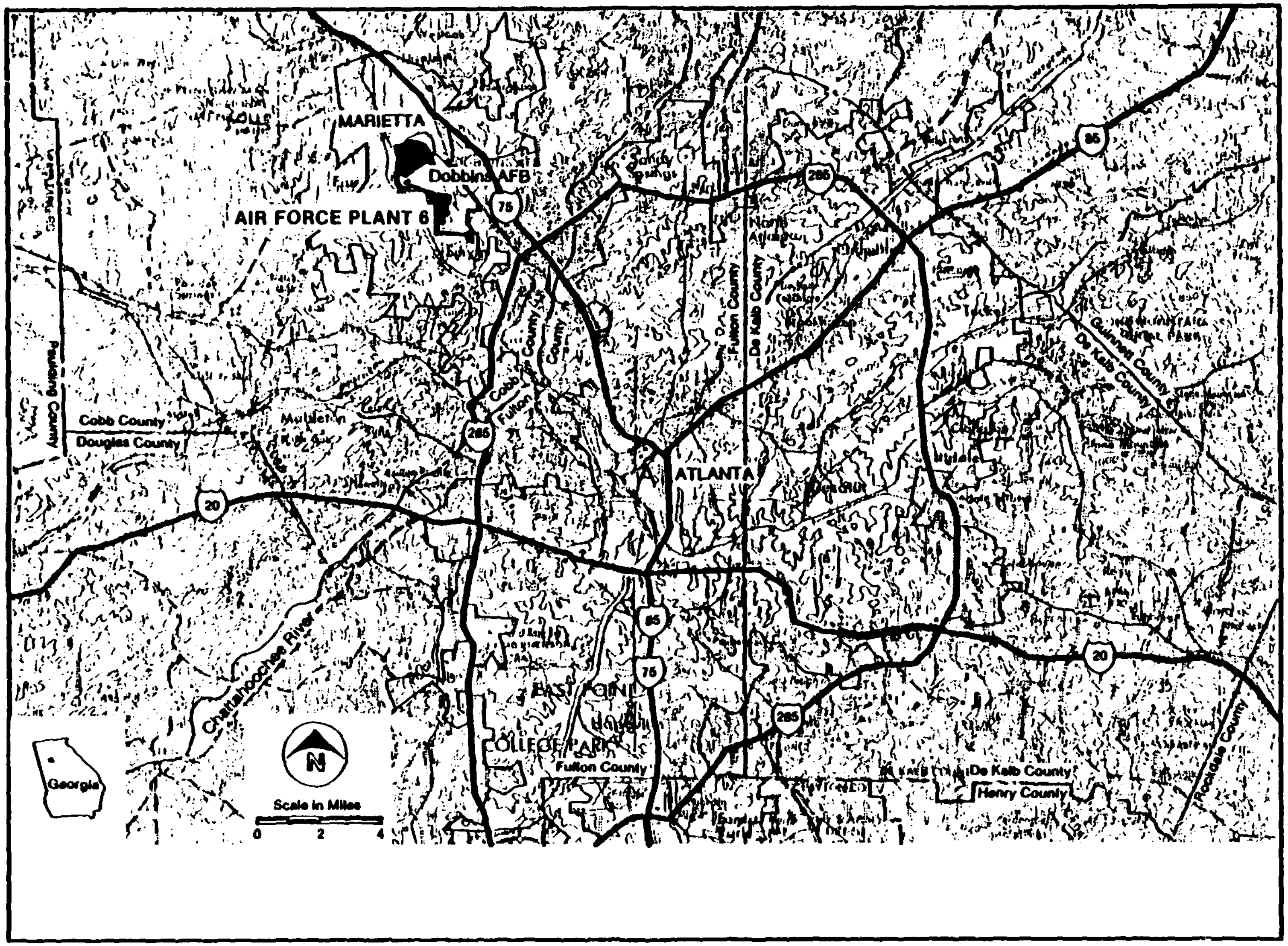

Figure 1.1-1
LOCATION MAP

SOURCE: CH2M HILL, 1984.

INSTALLATION
RESTORATION PROGRAM
Air Force Plant 6

The contamination assessment consisted of a Phase II, Stage 1 preliminary survey to determine the presence or absence of contaminants in environmental media at each site at Air Force Plant 6.

1.2 SUMMARY OF PHASE I--INITIAL ASSESSMENT/RECORDS SEARCH

To execute Phase I of the IRP, CH2M Hill was retained to conduct the Records Search at Air Force Plant 6 with funds provided by ASD. This Records Search was completed in March 1984.

The 12 sites identified in Phase I were evaluated by the USAF Hazard Assessment Rating Methodology (HARM). This system was developed by the Air Force, CH2M Hill, and Engineering-Science for specific application to the Air Force IRP for the purpose of rating the hazard potential of waste disposal facilities. It consists of rating factors that are divided into four categories: receptors, waste characteristics, pathways, and waste management practices.

A more detailed description of the evaluation methodology site-specific ratings is presented in the Records Search and the associated appendixes.

The HARM ranking was used by CH2M Hill to rate the 12 sites (see Table 1.2-1). The four new sites have not been rated according to the HARM; however, each of these sites has the potential to be a cause of offsite contaminant migration. ESE has designated a priority ranking for the 16 sites based on the potential for offsite migration and the magnitude and toxicity of the potential contaminants.

The 12 sites identified in the Phase I report and the 4 sites identified by contractors for Lockheed-Georgia Co. were organized into five zones of sites. The sites have been grouped because they are physically close to one another and, therefore, share the same ground-water and surface-water-flow patterns.

The 12 sites identified in the Records Search and the 4 additional sites identified by contractors for Lockheed-Georgia Co. are shown in Fig. 1.2-1, and a general description of each site is presented in Table 1.2-1.

Table 1.2-1. Summary of 16 Sites of Potential Environmental Contamination Identified at Air Force Plant 6

Site No.	Priority Ranking	Name	HARM Score	Period of Operation	Activity
Industrial Waste Land Disposal Area (Zone 1)					
G1	1	Surface Impoundment	74	1971-Present	Disposal of metal-plating sludge from Industrial Waste Treatment Plant (IWTP) and heat treatment salt wastes from heat treating and paint stripping operations. As of the time of the Records Search preparation (November 1983-March 1984), Surface Impoundment contained 5.5 MG of chemical solutions.
G3	6	Past Landfill	61	World War II-1972	Disposal of construction rubble. Medium quantities of sealants, paints, and adhesives are suspected to have been disposed here from approximately 1970 to 1972.
G4	11	Sanitary WWTP Sludge Disposal area	62	1951-Present	Disposal of anaerobically digested, dewatered sludge from the Sanitary WWTP.
Industrial Facilities, Active Landfill, and Stormwater Retention Basin No. 2 (Zone 2)					
G2	9	Active Landfill	61	pre-1951-Present	Disposal of construction rubble, scrap metal parts, old crates, empty drums, scrap lumber, and other miscellaneous items. Medium quantities of waste engine oil, fuels, and solvents may have also been dumped during the 1950s and possibly the 1960s.
G5	5	Stormwater Retention Basin No. 2	69	1977-Present	Collect runoff from the area in and around the existing landfill. On Mar. 22, 1983, approximately 500 gal of spilled TCE entered Basin No. 2. In 1980, the chip collection system sump clogged and overflowed cutting oil into Basin No. 2.

Table 1.2-1. Summary of 16 Sites of Potential Environmental Contamination Identified at Air Force Plant 6 (Continued, Page 2 of 3)

Site No.	Priority Ranking	Name	HARM Score	Period of Operation	Activity
Industrial Facilities, Active Landfill, and Stormwater Retention Basin No. 2 (Zone 2) (Continued)					
G8	8	Bldg. B-96 Complex	49	1968-1970	Area behind building may have been used for disposal of approximately 20 gal per month of commingled sealants, paints, and adhesives.
G9	2	TCE Spill at B-76	74	Mar. 22, 1983	Spillage of approximately 1,066 gal of TCE during tank car off-loading operation.
B-58 Wing Tank Seal Test Facility (Zone 3)					
G15	7	B-58 Wing Tank Seal Test Facility	NA	1952-present	Facility used to test wing tank seals of C-130 aircraft. Chlorinated organic ground-water contamination confirmed.
Industrial Waste Treatment Facility (Zone 4)					
G6	3	B-10 Aeration Basin	74	1942-Present	From 1942-1972, used to treat concentrated cyanide and metal-plating wastes. In 1972, dredged and expanded to current size and configuration. Currently operated for the purpose of (1) flow equalization prior to third level WWTP, (2) biological degradation of carbonaceous material, and (3) spill containment. Several dichromate spills have also occurred in the area.
G10	14	JP-5 Fuel Spill No. 2	64	Jan. 14, 1981	Spillage of approximately 21,000 gal of JP-5 during tank car off-loading operation.

Table 1.2-1. Summary of 16 Sites of Potential Environmental Contamination Identified at Air Force Plant 6 (Continued, Page 3 of 3)

Site No.	Priority Ranking	Name	HARM Score	Period of Operation	Activity
C-5 Flightline Area (Zone 5)					
G7	4	Position 65—C-5 Wash Rack Ponds	72	1967-Present	Washing or stripping aircraft.
G11	16	JP-5 Fuel Spill No. 1	7	Sept. 28, 1974	Spillage of approximately 25,000 gal of JP-5.
G12	12	Position 71—Sodium Dichromate Spill	66	Dec. 31, 1976	Rupture of water main spillage of 3.75 MG of water containing 20 ppm sodium dichromate.
G13	10	Position 58—Fuel/Defuel Station	NA	1967-present	Principal C-5 fuel station. Hydrocarbon contamination of ground water confirmed.
G14	11	Position 19—Fuel/Defuel Station	NA	1967-present	Principal C-5 fueling station. Organic solvent and hydrocarbon ground-water contamination confirmed.
G16	15	B-104 Gas Pump Station	NA	1969-present	Above and below ground gasoline storage tanks and pumps northwest of C-5 Wash Rack Ponds.

* MG = million gallons.

NA = Not available.

Source: CH2M Hill, 1984.

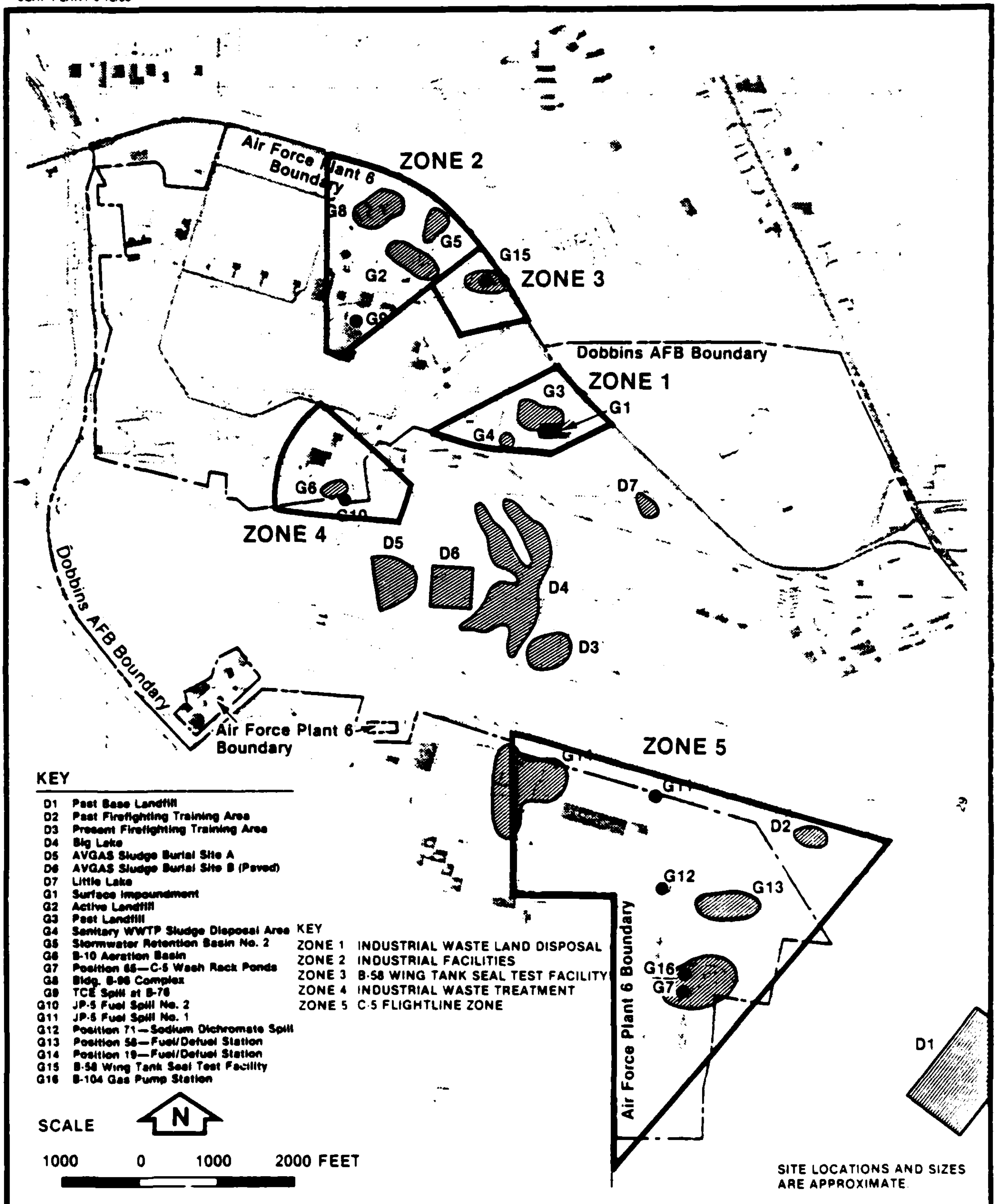

Figure 1.2-1
LOCATION MAP OF IDENTIFIED DISPOSAL AND SPILL SITES ON DAFB AND AIR FORCE PLANT 6

SOURCES: CH2M HILL, 1984; ESE, 1985

INSTALLATION RESTORATION PROGRAM
Air Force Plant 6

1.3 INSTALLATION HISTORY AND DESCRIPTION

Air Force Plant 6, located in Cobb County, Ga., forms part of the Military Complex with Dobbins Air Force Base (DAFB), the Naval Air Station (NAS) Atlanta, the Army National Guard, and the Georgia Air National Guard. The Military Complex encompasses approximately 3,336 acres; Air Force Plant 6 includes approximately 720 acres and is operated under contract by the Lockheed-Georgia Co. The locations of Air Force Plant 6, DAFB, the Georgia Air National Guard, the Army National Guard, and NAS Atlanta are shown on Fig. 1.3-1.

In 1942, Air Force Plant 6 was constructed by the Air Force to produce large aircraft for use in World War II. The plant was operated by Bell Aircraft Corp., under contract with the Air Force, from 1943 to 1946, and produced B-29 aircraft. The plant was closed in 1946 and was inactive until January 1951.

In January 1951, Air Force Plant 6 was reopened by Lockheed Aircraft Corp. to modify B-29 aircraft for the Korean Conflict and to produce the Boeing B-47 aircraft for the Air Force. Since reopening the plant in 1951, Lockheed-Georgia Co. has manufactured approximately 2,625 large aircraft. Additionally, more than 6,200 aircraft have undergone various modifications to improve aircraft performance. Air Force Plant 6 has produced B-47, C-130, JetStar, C-141, and C-5 aircraft and has modified B-29, C-5A, and C-141 aircraft.

Currently, the Lockheed-Georgia Co. is responsible for manufacturing C-130 and C-5 aircraft and modifying C-141 and C-5 aircraft at Air Force Plant 6. The majority of the work conducted at Air Force Plant 6 by the Lockheed-Georgia Co. is under Government contract (approximately 75 percent in 1983). Contracts between the Lockheed-Georgia Co. and Air Force Plant 6 are administered by the Air Force Plant Representative Office (AFPRO). AFPRO functions as the single onsite agency responsible for Government contract administration at the Lockheed-Georgia Co.

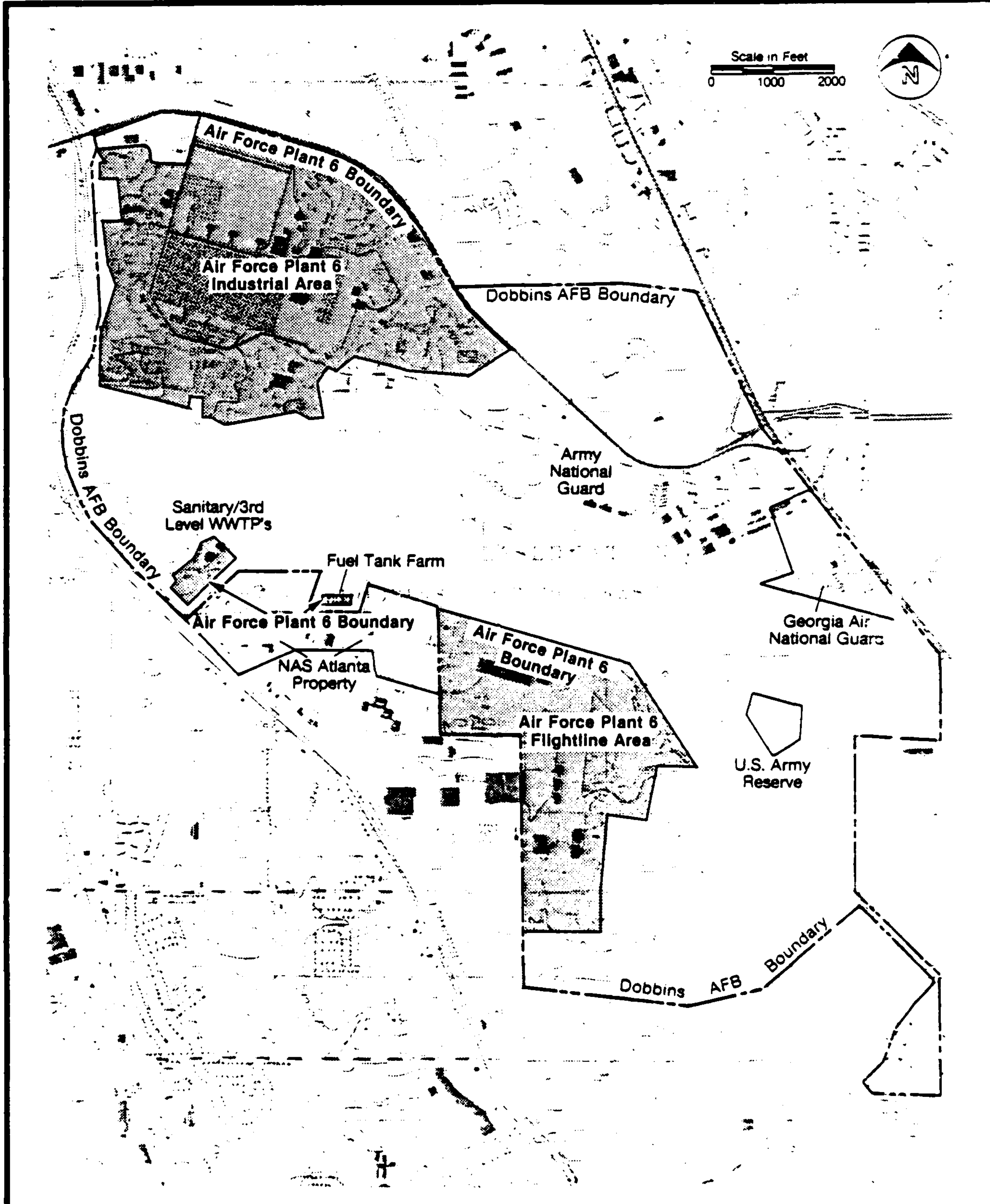

Figure 1.3-1
SITE MAP

SOURCE: CH2M HILL, 1984.

INSTALLATION
RESTORATION PROGRAM
Air Force Plant 6

1.4 OTHER INVESTIGATIONS

In 1951, Air Force Plant 6 was reactivated as a GOCO facility run by Lockheed-Georgia Co. No specific information is available regarding hazardous-waste-handling procedures prior to occupancy by Lockheed-Georgia Co. Air Force Plant 6 is a large industrial operation located on a site with a complex, hydrogeological system with the potential for many ground-water-quality concerns.

Lockheed-Georgia Co. and the Air Force have initiated a series of required and voluntary-hazardous-waste-compliance investigations at Air Force Plant 6.

The major Air Force effort is directed by DEQPPM 81-5, with the technical effort implemented by the USAFOEHL Technical Services Division through Phase II of the Installation Restoration Program (IRP). Phase I, the initial Records Search, was completed by CH2M Hill in March 1984. Twelve potential contamination sites were identified (Sites G1 through G12 on Table 1.2-1). The Position 19--Fuel/Defuel Station (Site G14), Position 58--Fuel/Defuel Station (Site G13) in the flightline area, the B-58 Wing Tank Seal Test Facility (Site G15), and the B-104 Gas Pump Station (Site G16) have been included in the Phase II, Stage 1 Confirmation/Quantification study by ESE based on additional information provided from Chester Engineers investigations for Lockheed-Georgia Co. (see Table 1.4-1).

Ground-water monitoring has been conducted according to RCRA regulations at the Surface Impoundment (Site G1) since 1980 when Law installed five monitoring wells. Ground-water sampling and analyses were performed. The results of the monitoring effort indicated contaminants were entering the ground-water and migrating in a downgradient direction. In response to these indications of contamination, Chester Engineers developed a ground-water assessment plan in November 1983 for Lockheed-Georgia Co. and presented this plan to Georgia EPD.

Table 1.4-1. Summary of ESE Sampling and Analyses for Air Force Plant 6 Phase II, Stage 1 Survey

Site No.	Zone	Site Description	Sample Locations	Scope of Work
G1	1	Surface Impoundment	None	Review past investigations.
G2	2	Active Landfill	Install and sample 1 monitoring well	TOC, TOX, oil and grease, pH, specific conductivity, water temperature, EPA Method 601 analytes.
G3	1	Past Landfill	None	Review past investigations.
G4	1	Sanitary Wastewater Treatment Plant (WWTP) Sludge Disposal Area	None	Review past investigations.
G5	2	Stormwater Retention Basin No. 2	Install and sample 1 monitoring well	Review past investigations. TOC, TOX, oil and grease, pH, specific conductivity, temperature, EPA Method 601 analytes.
G6	4	B-10 Aeration Basin	None	Review past investigations.
G7	5	Position 65—C-5 Wash Rack Ponds	None	Review/analyze data from past investigations.
G8	2	Bldg. B-96 Complex	None	Review/analyze data from past investigations.
G9	2	TCE Spill at B-76	None	Review/analyze data from past investigations.
G10	4	JP-5 Fuel Spill No. 2	None	Review/analyze data from past investigations.
G11	5	JP-5 Fuel Spill No. 1	Collect and analyze soil sample	Percent moisture petroleum hydrocarbons. Review/analyze data from past investigations.
G12	5	Position 71—Sodium Dichromate Spill	Install and sample 4 monitoring wells	TOC, TOX, oil and grease, pH, specific conductivity, water temperature, total chromium.
			Collect and analyze 3 soil samples	EP toxicity test for chromium.

Table 1.4-1. Summary of ESE Sampling and Analyses for Air Force Plant 6 Phase II, Stage 1 Survey (Continued, Page 2 of 2)

Site No.	Zone	Site Description	Sample Locations	Sample Analyses
G13	5	Position 58—Fuel/ Defuel Station	None	Review past investigations.
G14	5	Position 19—Fuel/ Defuel Station [Aviation Gasoline (AVGAS) Storage]	None	Review past investigations.
G15	3	B-58 Wing Tank Seal Test Facility	None	Review past investigations.
G16	5	B-104 Gas Pump Station	None	Review past investigations.

Abbreviations:
TOC = total organic carbon.
TOX = total organic halogens.
EPA = U.S. Environmental Protection Agency.
EP = extraction procedures.
AVGAS = aviation gasoline.

Note: Sites G1 through G12—Identified during Phase I.
Sites G13 through G16—Sites identified after completion of Phase I Report.

Source: ESE, 1985.

Concurrently, Federer-Sailors and Associates, Inc. installed 21 wells for a ground-water-monitoring program for underground fuel tanks at Air Force Plant 6 in early 1983 for Lockheed-Georgia Co. as a voluntary environmental protection measure. Visual inspection for material contamination was conducted on a semiannual basis.

As a result of a Consent Agreement in April 1984 between Georgia EPD, Lockheed-Georgia Co., and USAF regarding the Surface Impoundment (Site G1), Wilson and Co. Architects/Engineers implemented the Ground Water Quality Plan completed in October 1984.

This investigation was concurrent with other site environmental investigations by Chester Engineers beginning in February 1984. The scope of work included investigation of the following:

1. TCE Spill at B-76 (Site G9) which flowed into the Stormwater Retention Basin No. 2 (Site G5),
2. Position 65--C-5 Wash Rack Ponds (Site G7), and
3. Position 19--Fuel/Defuel Station (Site G14).

Many of these investigations were initiated based on recommendations from the October 1983 JRB Associates report entitled "Environmental, Energy, and Resource Conservation Review of Air Force Plant 6."

On July 23, 1984, Lockheed-Georgia Co. authorized Chester Engineers to conduct environmental investigations at three locations identified as having possible ground-water contamination. The three sites were not previously identified as part of the Air Force IRP investigation effort. The three sites are identified as follows:

1. B-58 Wing Tank Seal Test Facility--This is a discrete source of contamination that has the potential to discharge to Stormwater Retention Basin No. 2 (Site G5) and directly offsite. It is be designated as Site G15.
2. B-104 Gas Pump Station--This is an isolated contamination source adjacent to the existing IRP Site G7 (Position 65--C-5 Wash Rack Ponds). It is designated as Site G16.

3. Position 58--Fuel/Defuel Station--This is a contamination source not previously investigated or included in the initial 12 Phase I sites. It is designated Site G13 in the IRP Phase II investigation.

During August 1985, Lockheed-Georgia Co. authorized Chester Engineers to develop additional ground-water assessment plans in-accordance-with the Hazardous and Solid Waste Amendments of 1984. The ground-water assessments will be conducted at the following sites:

1. TCE Spill at B-76 (Site G9) and Stormwater Retention Basin No. 2 (Site G5),
2. B-58 Wing Tank Seal Test Facility (Site G15),
3. Position 65--C-5 Wash Rack Ponds (Site G7), and
4. B-104 Gas Pump Station (Site G16).

Table 1.4-2 includes a summary of relevant environmental assessment studies reviewed by ESE during preparation of this report.

Lockheed-Georgia Co. is submitting a revised Part "B" Hazardous Waste Facility Permit Application due Nov. 8, 1985, to Georgia EPD. This permit application will encompass the following two RCRA-regulated facilities plus the Surface Impoundment (Site G1) previously submitted by Lockheed-Georgia Co.:

1. B-10 Aeration Basin at the Industrial Waste Land Disposal Zone (Sites G6 and G10), and
2. Hazardous Waste Drum Storage Zone (Bldg. B-10, Bldg. B-96, T-559).

Lockheed has notified the Georgia EPD on Nov. 8, 1985, of the intent to close the following facilities:

1. Industrial Facilities and Active Landfill (Sites G9, G8, G2, and G5) due to the TCE spill,
2. B-58 Wing Tank Seal Test Facility (Site G-15), and
3. Position G5--C-5 Wash Racks.

Table 1.4-2. Summary of Relevant Environmental Assessment Studies

Date	Firm	Site Description	Site No.	Scope
11/80 03/81	Law Engineering and Testing Co.	Surface Impoundment	G1	Installed 5 monitoring wells for RCRA ground-water-monitoring program; sampled/analyzed through 1983, subsurface exploration.
12/81	Lockheed-Georgia Co.	Air Force Plant 6	All	IRP Records Search Program.
04/82	CH2M Hill	DAFB	D1-7	IRP Records Search for AFESC.
02/83	Federer-Sailors and Associates, Inc.	Air Force Plant 6 underground fuel tanks	MW1-MW21	Ground water monitoring well installation report.
06/83	Lockheed-Georgia Co.	Air Force Plant 6	All	Part A EPA permit application.
07/83	Lockheed-Georgia Co.	Air Force Plant 6	All	Part B EPA permit application.
10/83	JRB Associates	Air Force Plant 6	All	Environmental, Energy, and Resource Conservation Review for USAFOEHL.
11/83	Chester Engineers	Surface Impoundment	G1	Report for Ground Water Quality Assessment Plan, Industrial Waste Disposal Basin
12/83	Chester Engineers	Surface Impoundment	G1	Addendum No. 1 (12/5/83).
3/84	Chester Engineers	Air Force Plant 6	All	Preliminary Reconnaissance Survey of Ground-Water Quality.

Table 1.4-2. Summary of Relevant Environmental Assessment Studies (Continued, Page 2 of 3)

Date	Firm	Site Description	Site No.	Scope
03/84	Chester Engineers	Air Force Plant 6	All	Solid waste management plan.
03/84	CH2M Hill	Air Force Plant 6	G1-G12	IRP Records Search Phase I.
04/84	Chester Engineers	Interim report on hydrogeologic investigations:		Technical Memorandum No. 1.
05/84	Chester Engineers	o B10 Aeration Basin o TCE Spill Basin No. 2 o Position 19 Fuel Spill	G6 G9/G5 G14	Technical Memorandum No. 2.
07/84	Chester Engineers	o C-5 Wash Rack Ponds o Waste Disposal System	G7 G6	Technical Memorandum No. 3.
10/84	Wilson and Co. o Hanson Engineers, Inc.	Surface Impoundment (dike integrity study)	G1	Ground-water-quality assessment report.
11/84	Chester Engineers o Geological Associates	B-10 Aeration Basin (dike integrity study)	G6	Ground-water-quality assessment plan.
11/84	Chester Engineers	o Bldg. 58 o B-104 Gas Pump o Position 58	G5 G16 G13	Environmental site assessments supplemental investigation. (Investigation was initiated on July 23, 1984).
11/84	Chester Engineers	o TCE Spill Area o C-5 Wash Rack Ponds o Position 19	G6/G9 G7 G14	Environmental site assessment. (Investigation was initiated on Feb. 27, 1984).
02/85	Chester Engineers	B-10 Aeration Basin	G6	Revision of Ground Water Assessment Plan.

Table 1.4-2. Summary of Relevant Environmental Assessment Studies (Continued, Page 3 of 3)

Date	Firm	Site Description	Site No.	Scope
07/85	ESE	DAFB	D1-D7	IRP Phase II, Stage 1 Confirmation/Quantification draft submittal.
08/85	ESE	Air Force Plant 6	G1-G16	IRP Phase II, Stage 1 Confirmation/Quantification draft submittal.
08/85	Chester Engineers	o TCE Spill--Stormwater Retention Basin o B-58 Wing Tank Seal Test Facility o C-5 Wash Rack/B-104	G5/G9 G14 G7/G16	Not available.
08/85	Wilson and Co. Architects and Engineers	Chem Mill IWTP	G6	Alternate treatment assessment for phenolic compounds and waste stream reduction at the Chem Mill.
10/85	IT Corporation	B-10 Aeration Basin	G6	Ground Water Quality Assessment.
11/85	Lockheed-Georgia Co.	Air Force Plant 6	All	Revised EPA Part B Hazardous Waste Facility permit.
12/85	ESE	Air Force Plant 6	All	Final Draft IRP Phase II Investigation and Report.

Source: ESE, 1985.

These three zones were not included in the Part "B" Hazardous Waste Permit.

Also in July 1985, Wilson and Co. Engineers/Architects submitted an engineering report on alternative treatments for phenolic compounds and waste stream reduction measures for chemical milling operations at Air Force Plant 6.

1.5 PURPOSE AND SCOPE

Phase II of the IRP addresses the confirmation and quantification of the extent and magnitude of contaminant migration from sites identified in Phase I. Phase II, Stage 1 consists of a preliminary survey to confirm or rule out the presence and/or migration of contaminants. If the Phase II, Stage 1 work confirms the presence and/or migration of contaminants, then Phase II, Stage 2 field work would be conducted to determine the extent and magnitude of the contamination and contaminant migration.

This study constitutes the Phase II, Stage 1 preliminary survey at Air Force Plant 6 conducted by ESE and Law. The purpose of the study was to assess the presence or absence of contamination and/or migration of contaminants. The Phase II, Stage 1 investigation addressed the 12 disposal, spill, and storage zones defined in Phase I as described in Table 1.2-1 (Sites G1 through G12) and 4 additional sites (G13 through G16) identified by Lockheed-Georgia Co. The level of effort conducted at each site was dependent on the nature of the contamination potential present, and on the degree and depth of similar investigations conducted by consultants for Lockheed-Georgia Co. at Air Force Plant 6. For example, given that the extensive ground water investigations were currently underway at Air Force Plant 6 and the similarity of these studies to typical Phase II, Stage 1 investigations, installation of additional wells was not recommended for those sites under active study. Consequently, the scope of work was limited to the review and analysis of the existing Lockheed-Georgia Co. studies, the installation of six

wells, and sampling and analysis of ground water and soils at Sites G2, G5, G11, and G12.

The broad range of environmental investigations currently underway at Air Force Plant 6 requires effective coordination to ensure the following:

1. Effective communication and exchange of information on various investigations conducted by Lockheed-Georgia Co. and the Air Force;
2. A systematic, organized approach to efficiently assess past, current, and future tasks to identify sources of contamination and potential migration routes; and
3. Coordination of any future monitoring, assessment, or remedial action measures under RCRA or the IRP into existing wastewater, industrial waste, and solid waste management plans. This would be cost efficient and is necessary to avoid cross contamination or creation of contaminant sources or pathways for offsite contaminant migration.

This report will summarize and incorporate past reports into the Phase II Confirmation/Quantification Stage 1. The findings, conclusions, and recommendations are based on the data presented in these previous investigations as well as ESE's limited field investigations.

1.6 PROJECT STAFF

Key personnel participating in the Air Force Plant 6 Phase II, Stage 1 survey are listed below.

C. Richard Neff, P.E., Engineer	Overall Project Manager (ESE)
D.E. Bruderly, P.E., Engineer	Report Project Manager (ESE)
T.A. Brislin, Civil/Env. Engineer	Project Coordinator (ESE)
T.L. Cross, P.E., Senior Hydrologist	Subcontractor Project Manager (Law)
K.J. Seefried, P.E., Engineer	Project Engineer (Law)
C.H. Spiers, P.G., Hydrogeologist	Site Hydrogeologist (Law)

M.J. Geden, Geologist	Field Team Leader (ESE)
M.T. Park, Chemist	Quality Assurance (ESE)
S.A. Denahan, P.G., Hydrogeologist	Project Hydrogeologist (ESE)
S.R. Holm, Geologist	Project Geologist (ESE)
E. Flaig, Soil Scientist	Computer Programmer (ESE)

2.0 ENVIRONMENTAL SETTING

2.1 PHYSIOGRAPHY AND DRAINAGE

Air Force Plant 6 is situated in the Central Uplands district of the Piedmont physiographic province. Topography in this region typically consists of low, linear ridges separated by broad, open valleys. Streamflow through this area is controlled by and is generally transverse to the underlying geologic structure.

The installation is located on a gently-rolling plateau which slopes gradually to the southeast. The land surface has been cut by several small stream channels, including Walkers Gorge and Rottenwood and Poorhouse Creeks. Land-surface elevations on the site range from approximately 1,075 feet (ft) National Geodetic Vertical Datum of 1929 (NGVD) in the northwest portion of the installation to approximately 950 ft NGVD at the southeast corner.

Surface-water drainage on the installation follows land surface trends and is generally to the east toward Rottenwood and Poorhouse Creeks via the stormwater-drainage system. Fig. 2.1-1 illustrates onsite topography and surface-water-flow direction. Two surface water retention areas located on DAFB property, referred to as Big Lake and Little Lake, are also illustrated in Fig. 2.1-1. Big Lake is a dammed reservoir, which was previously used (prior to 1941) as a water supply source for the city of Marietta. Little Lake is also manmade, formed by a small dike across a tributary of Rottenwood Creek. Both lakes receive surface water drainage from Air Force Plant 6.

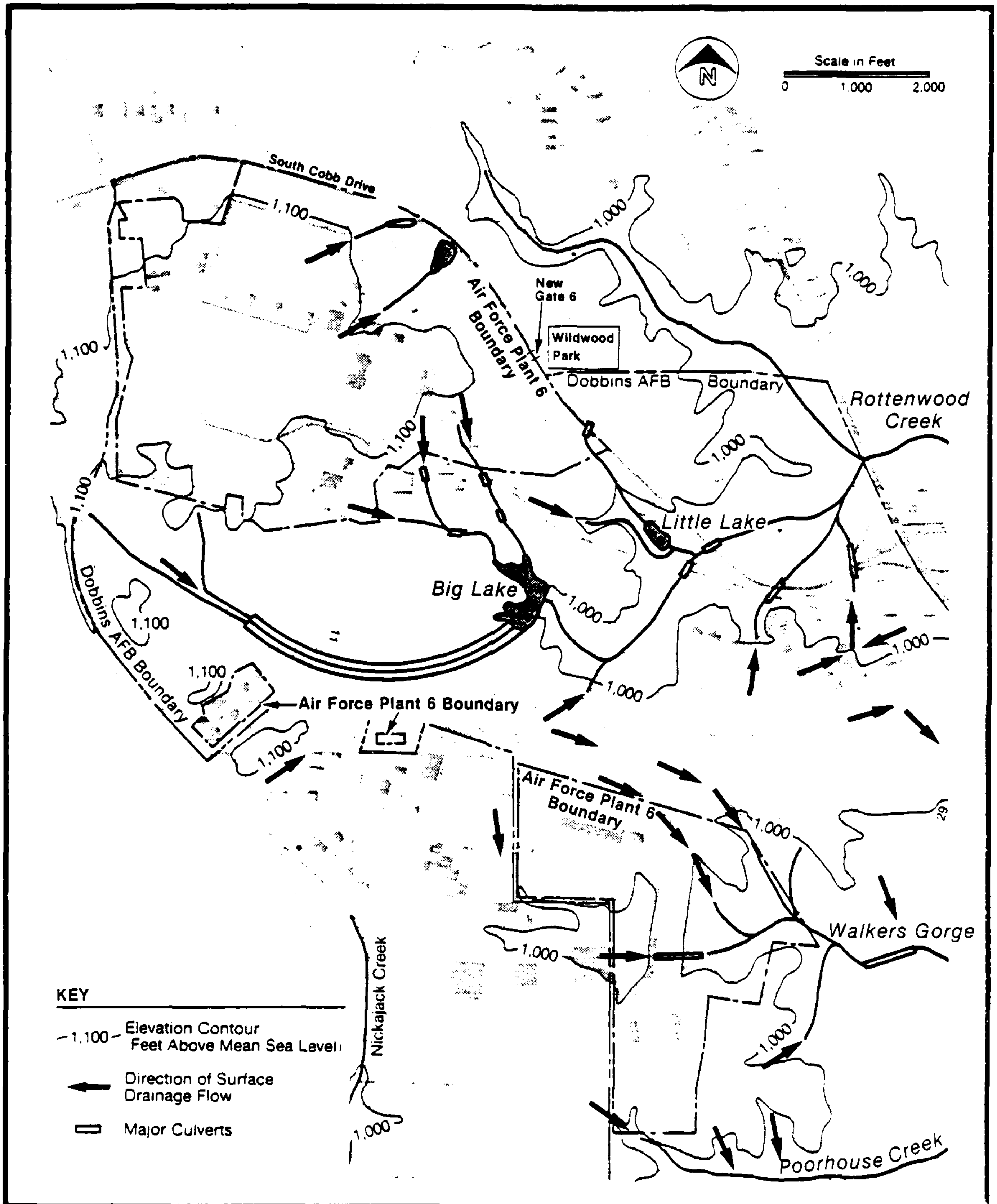

Figure 2.1-1
SURFACE DRAINAGE MAP OF AIR FORCE PLANT 6 AND VICINITY

SOURCE: CH2M HILL, 1984.

INSTALLATION RESTORATION PROGRAM
Air Force Plant 6

Walkers Gorge, Rottenwood Creek, and Poorhouse Creek discharge to the Chattahoochee River. Flow in these creeks ultimately is in a south or southeast direction discharging to the Chattahoochee just north of where Interstate 75 crosses the river. The Chattahoochee is the longest river in Georgia, extending approximately 436 miles from its source in northeastern Georgia to the Florida border. The Chattahoochee River is used as a source of potable water and is a major recreational area for the Atlanta metropolitan area.

2.2 METEOROLOGY

The climate in the vicinity of Air Force Plant 6 is characteristic of the northern-temperate zone, with four clearly-separated seasons and predominant weather-system movement from west to east. Summary meteorological data are shown in Table 2.2-1. The average annual temperature at Air Force Plant 6 is 61°F with an average daily maximum and minimum of 70°F and 51°F, respectively. The average annual precipitation at Air Force Plant 6 is 49.7 inches of rainfall and approximately 3 inches of snowfall. Precipitation is fairly evenly distributed throughout the year, although minor peaks in the rainfall curve are generally recorded in early spring and in mid-summer. The maximum precipitation recorded in a 24-hour period was 4.9 inches.

2.3 REGIONAL GEOLOGY AND HYDROGEOLOGY

Surficial deposits at Air Force Plant 6 consist of residual soils derived from the in-place weathering of the underlying igneous and metamorphic bedrock. These soils are primarily micaceous, clayey silts and micaceous, sandy silts. Density or consistency of the soils typically increases with depth. The weathered, erosional surface of the rock is irregular, and, therefore, depth to competent rock is variable throughout the site. The permeability of the soil horizon is variable depending on the degree of compaction and relative percentages of sand and clay.

Table 2.2-1. Meteorological Data Summary for Air Force Plant 6, Cobb County, Ga.

	Months												
	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
Temperature (°F)													
Average Maximum	50	54	62	72	79	85	88	87	81	72	61	53	70
Average Minimum	33	34	41	50	58	66	69	66	63	51	41	35	51
Mean	42	44	51	61	69	76	79	78	72	61	51	44	61
Precipitation (inches)													
Mean	5.1	4.7	6.3	4.5	4.5	3.7	5.2	3.9	3.5	2.8	3.8	5.0	53.0
Maximum Monthly	12.4	11.2	13.3	12.6	8.9	10.4	11.9	1.2	8.7	8.4	7.5	12.3	15.3
Minimum Monthly	0.0	0.0	0.0	1.3	0.2	0.8	0.1	0.5	0.0	0.0	0.0	0.0	0.0
Maximum in 24 Hours	4.7	4.1	4.2	3.9	4.3	3.2	4.0	3.0	3.5	4.5	4.7	3.0	4.9
Snowfall (inches)													
Mean	§1	1	1	0	0	0	0	0	0	0	§1	1	3
Maximum Monthly	3	5	13	0	0	0	0	0	0	0	1	5	13
Maximum in 24 Hours	2	4	4	0	0	0	0	0	0	0	1	4	4
Relative Humidity (%)													
Mean	69	63	61	69	70	79	71	74	74	70	78	69	69
Surface Winds (knots)													
Mean	6	6	6	5	5	4	4	4	4	5	5	6	5
Maximum Peak	52	64	52	52	63	78	69	69	48	46	47	49	78
Prevailing Direction	WNW	WNW	WNW	W	W	W	W	E	E	E	E	WNW	WNW

Period of record: 1948-1980.

Source: NOAA, 1975.

Bedrock at the site consists principally of metamorphic rock (primarily biotite gneiss and schist) and possibly some igneous rock (primarily granite). Metamorphic rock within southeastern Cobb County occurs in wide belts trending in a northeast direction. These belts are the result of repeated structural deformations which have produced extremely complex structures, including closed folds, overthrust faults, and igneous intrusions. Figure 2.2-1 shows the primary geologic units at Air Force Plant 6 and illustrates the complexity of the bedrock geology.

Primary porosity and permeability of the metamorphic rock are extremely low; however, structural deformations have produced planes of secondary permeability, along which ground-water movement occurs. These secondary permeability zones consist of fault planes, fractures, shear zones, planes of schistosity resulting from folding, and intrusive contacts around the margins of large intrusive bodies.

Igneous rock occurs as granitic intrusions into the older metamorphic rock. Horizontal joints or parting planes occur occasionally within granitic intrusive bodies producing horizontally concentric sheets that are convex-upward beneath hills and uplands and concave-upward beneath valleys and lowlands. This type of joint pattern is conducive to the accumulation and storage of ground water in the valleys and to drainage of water beneath hills.

Ground water occurs under unconfined or water-table conditions within the residual soils and underlying rock. In some isolated areas, residuum at depth may contain a higher percentage of clay, which can lead to formation of a saturated lens, above and below which unsaturated conditions exist. This perched water table is of limited areal extent and usually occurs only intermittently following periods of substantial infiltration.

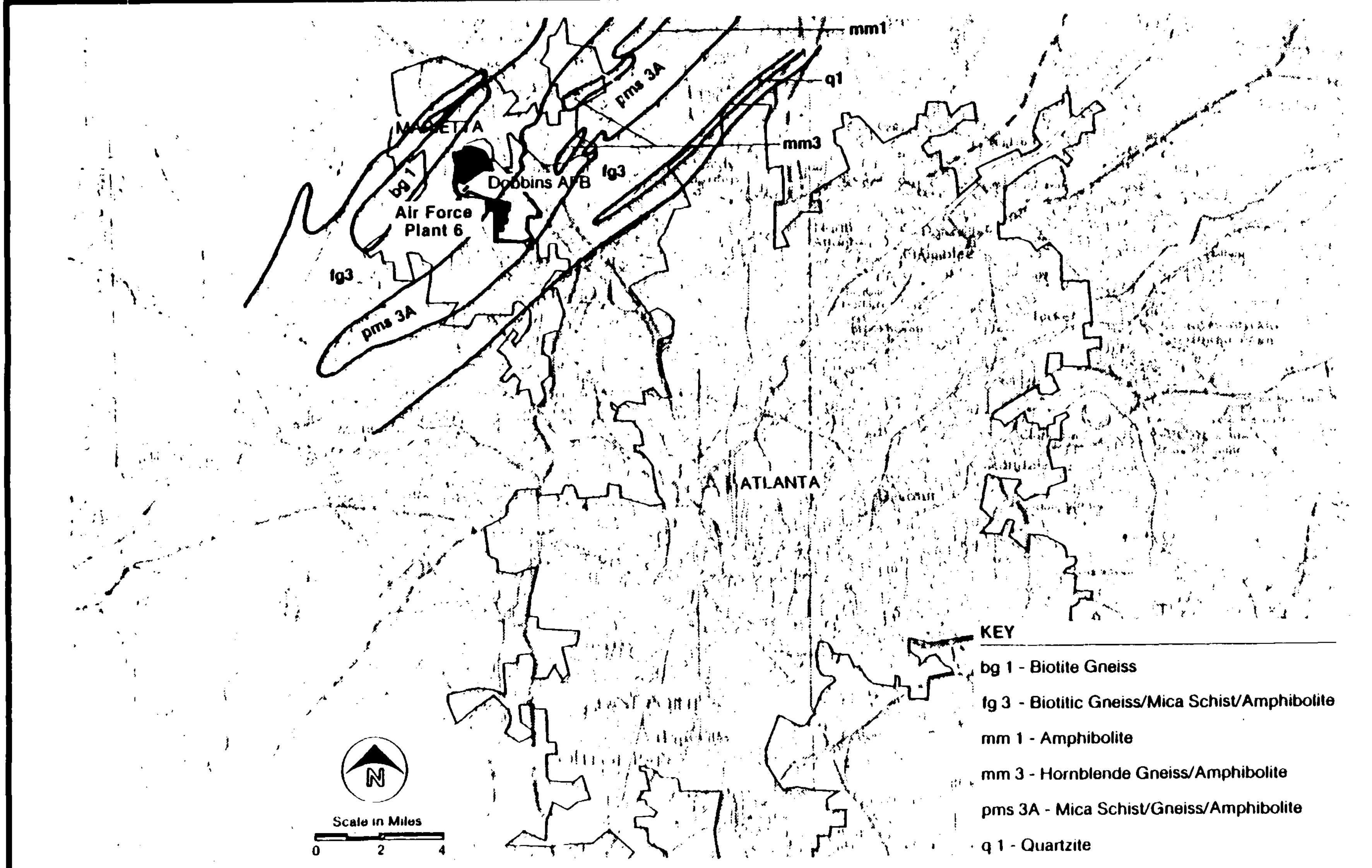

Figure 2.2-1
GEOLOGIC MAP OF AIR FORCE PLANT 6 AND VICINITY

SOURCE CH2M HILL, 1984.

INSTALLATION RESTORATION PROGRAM
Air Force Plant 6

The depth to the permanent-water table is highly variable, being dependent on a variety of factors, including surface topography, soil permeability, rainfall/evapotranspiration, and underlying bedrock structure. The water table generally follows the land-surface configuration, as a subdued expression of the surface topography. However, the complex geometry of the secondary permeability features typically results in higher anisotropic ground water flow in bedrock aquifers. Ground-water flow under these conditions can be difficult to predict from limited data.

Recharge to the water-table aquifer is direct through the surface soil either by infiltration of rainfall or by seepage from streambeds and surface impoundments. Because of the low permeability of the residual soils, infiltration rates are low and subsequent surface-water runoff rates high.

Ground water is seldom used for public-water supply locally, primarily because of the limited well yield. However, numerous individual water-supply wells are located in the region. Well yields are usually low, ranging from 1 to 25 gallons per minute (gpm). Well yields are also highly variable, since the yield is dependent on the magnitude and occurrence of underlying permeable structural features such as joints, faults, and shear zones, which are highly irregular in occurrence. Most water supply in the vicinity of Air Force Plant 6 is developed from surface-water sources.

2.4 LOCATION OF ONSITE AND OFFSITE WATER SUPPLY WELLS

Water for both potable and process use at Air Force Plant 6 is supplied by the Cobb-Marietta Water Authority. Sixteen inactive water-supply wells located on DAFB and Air Force Plant 6 have been out of service since the early 1950s (see Fig. 2.4-1). Seven of these inactive wells were sampled on May 16, 1984. Results are shown in Table 2.4-1. Each inactive well is less than 300 ft in total depth; individual well yields varied, and the maximum combined total capacity of the system was

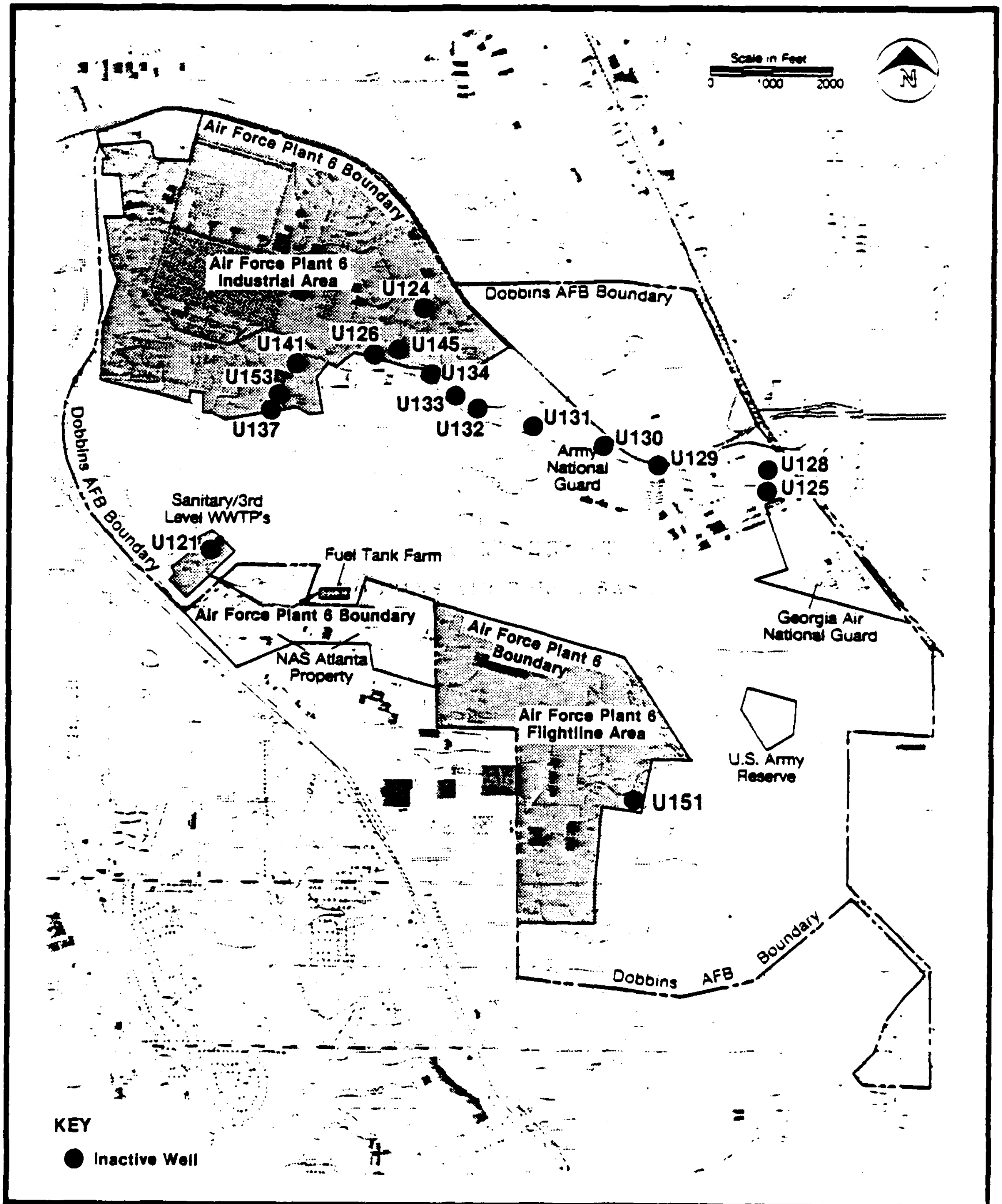

Figure 2.4-1
LOCATION MAP OF INACTIVE WATER SUPPLY WELLS

SOURCE: CH2M HILL, 1984.

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Table 2.4-1. Water Supply Wells Results, Sampled on May 16, 1984

Parameters	Well Sample Numbers						
	U-124	U-125	U-126	U-128	U-129	U-130	U-131
Specific Conductivity, Field (umhos/cm)	105	120	199	75.0	76.0	112	75.0
pH, Field (Std Units)	6.80	6.10	6.80	5.60	5.70	6.80	5.80
Oil and Grease (mg/l)	16	5	14	7	5	22	6
Carbon, TOC (mg/l)	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
TOX (mg/l-CL)	0.038	0.040	0.039	0.072	0.053	0.230	0.110
Water Temperature (°C)	15.0	15.0	15.0	15.0	15.0	15.0	15.0

Abbreviations:
umhos/cm = micromhos per centimeter
mg/l = milligrams per liter
TOC = total organic carbon
TOX = total organic halogens
ug/l = micrograms per liter
°C = degrees Celsius

Note: See article entitled "TOC Determinations in Ground Water" in Appendix Q which explains why Oil and Grease values can be higher than TOC. TOC samples are purged volatilizing organics that would be captured in the Oil and Grease analyses by freon extractor.

Source: ESE, 1985.

approximately 0.5 million gallons per day (MGD). The well system was intended to be used as a backup water supply system in case an adequate supply was not available from the Cobb-Marietta Water Authority at that time of installation.

2.5 DESCRIPTION OF SITES

The 12 sites identified in the Phase I report and the 4 sites identified by Lockheed-Georgia Co. were summarized in Table 1.2-1 and organized into five zones based on the proximity of the sites within a common hydrologic unit. The sites are discussed individually in the following subsections, with referenced figures illustrating the site description and associated monitoring wells.

Appendix N is a compilation of a complete monitoring well inventory for Air Force Plant 6, including well identifications, locations, grid coordinates, ground elevations, well depths, and depths to bedrock. Appendix Q contains executive summaries of various reports that condense historical findings and a plant coordinate blueline that identifies each zone, individual sites, and location of each monitoring well for Air Force Plant 6 and adjacent Dobbins AFB.

Section 4.0 of this report presents a summary of the current and historical results with significant findings referencing the sampling and analytical source.

2.5.1 INDUSTRIAL WASTE LAND DISPOSAL AREA (ZONE 1)

This zone consists of Sites G1 (Surface Impoundment), G3 (Past Landfill), and G4 (Sanitary WWTP Sludge Disposal Area) as shown in Fig. 2.5-1. Piezometers and monitoring well locations are shown along with major physical features such as Radome Building (B-90), the Patrol Rd., and Industrial Dr. The wells and piezometers were installed and sampled by Wilson and Co. and Law Engineering Co. (Wilson and Co., 1984). The shallow soils in the zone range in thickness from 18 to over 80 ft thick. These soils form an unconfined aquifer with no interbedded clays present. An unnamed stream transects the area from northwest to southeast. The Wilson study documents that the stream is an effluent (gaining) stream.

The bedrock aquifer is not well defined; however, flow conditions are generally believed to follow the stream valley and the shallow aquifer. High vertical permeabilities exist in the shallow aquifer system and

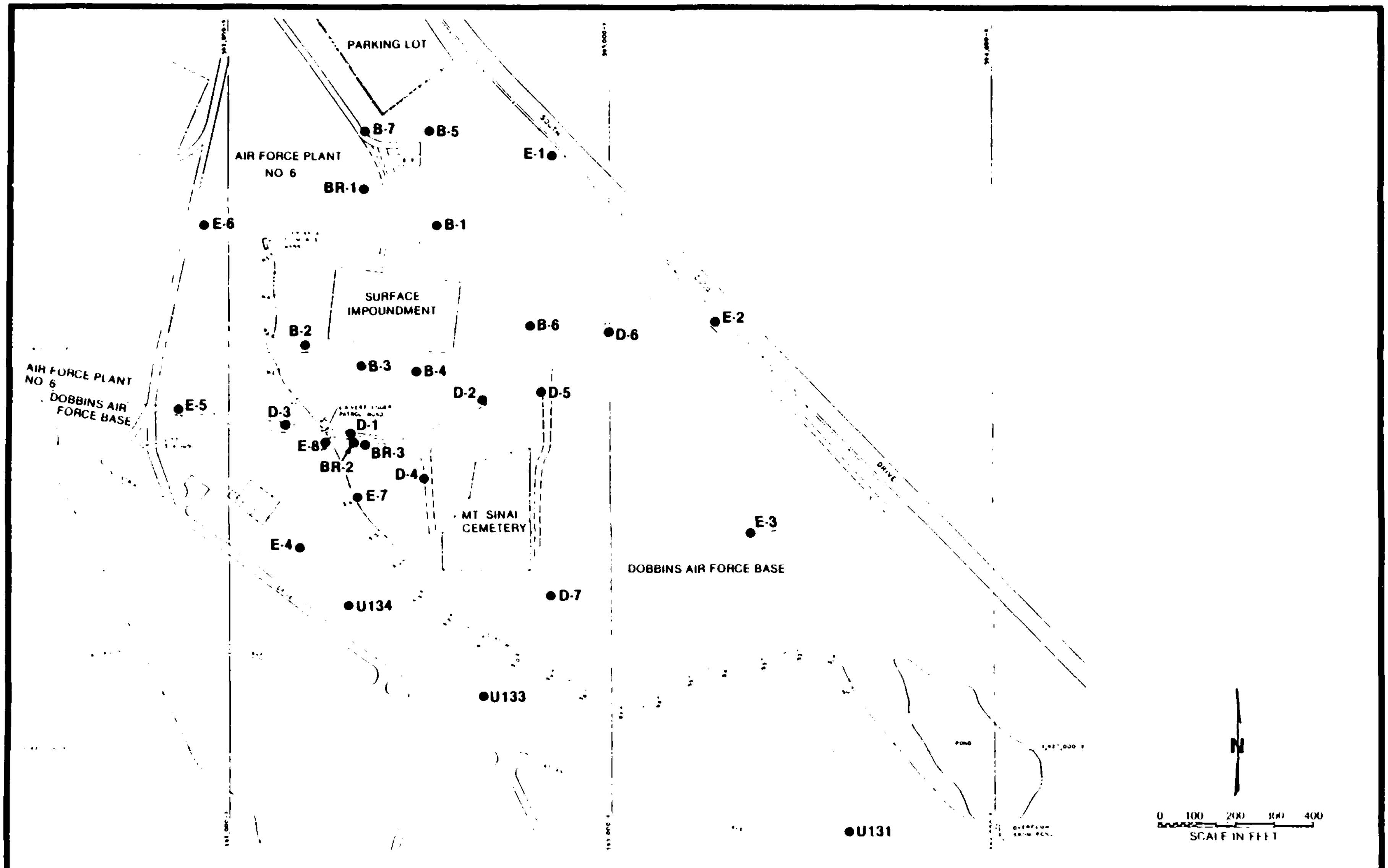

Figure 2.5-1
ZONE 1, INCLUDING MONITORING WELL LOCATIONS AT SITE G1—SURFACE IMPOUNDMENT, SITE G3—PAST LANDFILL, AND SITE G4—SANITARY WWTP SLUDGE DISPOSAL AREA
SOURCE: LAW ENGINEERING CO.

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provide a pathway for contaminant flow to locally recharge the bedrock system.

Fig. 2.5-2 presents interpreted shallow ground water contours and flow for Zone 1. Flow is to the southeast and onto DAFB.

Site G1--Surface Impoundment (Zone 1)

The Surface Impoundment is located approximately 300 ft south of the existing Radome Building (B-90) and 150 ft north of Patrol Rd. as shown in Fig. 2.5-1 on a site that was previously used as a landfill for plant wastes. The Surface Impoundment was constructed for disposal of the sludge produced from the industrial waste treatment plant (IWTP) and other wastes unsuitable for treatment at the IWTP.

The plan dimensions of the impoundment are approximately 150 by 350 ft. Reportedly, construction included a cut along the north side of the impoundment and filled dikes along the remaining three sides. Dike elevations reportedly vary from about 1,062 to 1,064 ft. The impoundment has an approximate surface area of 1.42 acres and a depth of 17.5 ft to the top of the berm. Fig. 2.5-3 is a photograph of the impoundment taken from the northeast corner of the dike. The surface materials in the impoundment area generally slope to the west and south. Surface drainage in the area is to the southwestern side of the impoundment toward the stream. Ground cover at the site consists of exposed soils, waste materials, and scattered grass.

Although construction details of the impoundment are sketchy, reportedly the pond was built between 1969-1971 with a compacted clay liner. Some of the old landfill materials reportedly were removed in portions of the impoundment area prior to placement of the new liner fill. The actual extent and composition of the old landfill materials are not known; however, the landfill is reportedly composed primarily of construction rubble. During construction of the landfill, approximately 1 ft of clay cover reportedly was placed above each 1.5 to 2 ft of waste.

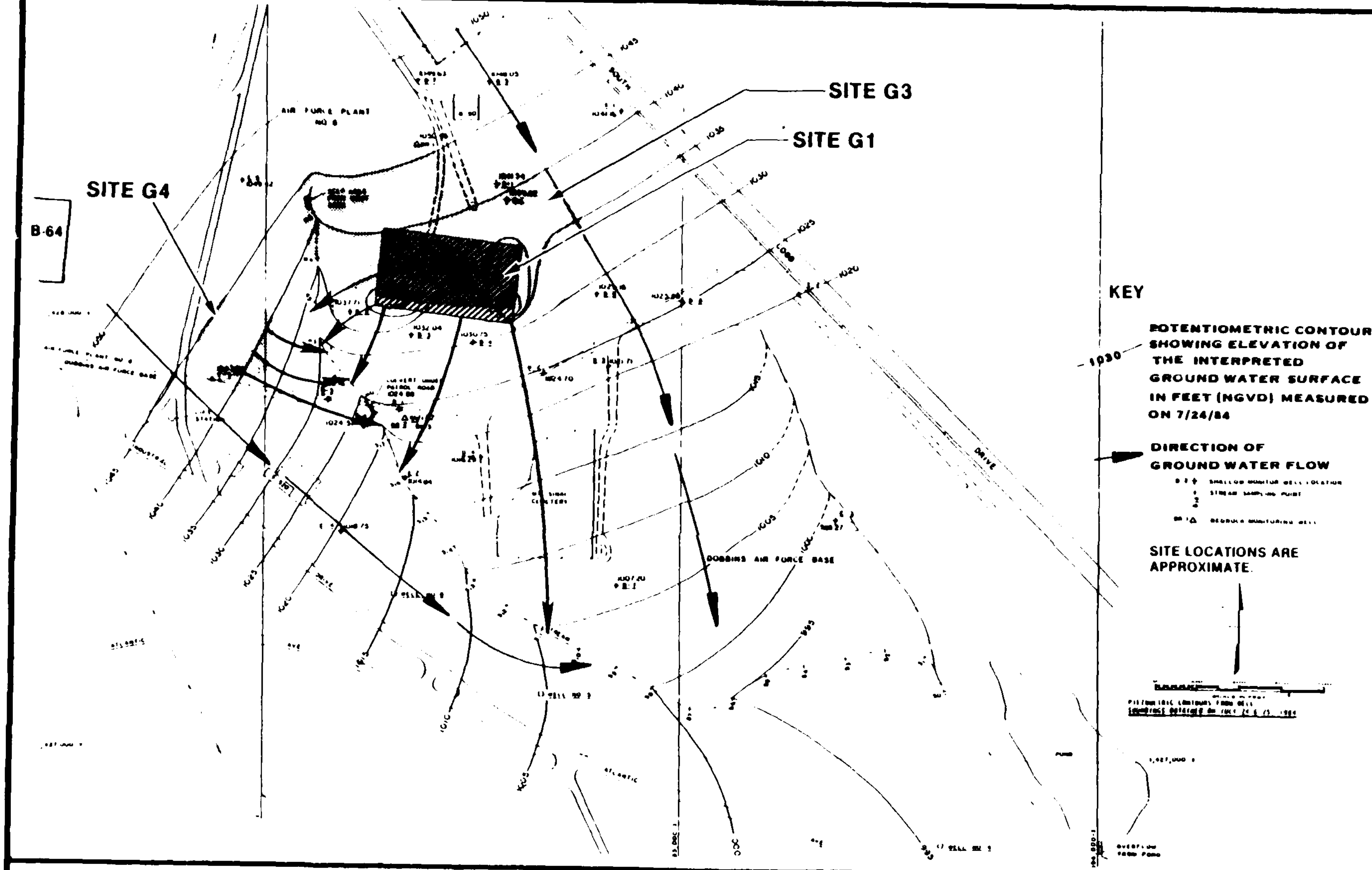

Figure 2.5-2
INTERPRETED GROUND WATER CONTOURS FOR ZONE 1, INCLUDING SITE G1—SURFACE IMPOUNDMENT, SITE G3—PAST LANDFILL, AND SITE G4—SANITARY WWTP SLUDGE DISPOSAL AREA
SOURCE: WILSON AND CO., 1984.

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Figure 2.5-3
SITE G1—SURFACE IMPOUNDMENT

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The impoundment has been in continuous use since its construction. The waste material which was initially deposited in the basin had previously been retained in a basin near Bldg. B-10. The following wastes are reported to have been placed in the basin: heavy metal sludge, paint residues and sludge, miscellaneous waste heat salts and materials which include sulfates, fluorides, chlorides, lime, iron, oils, and possibly cyanides. Chemical analysis of sludge and sludge pore waters detected halogenated compounds such as TCE (30 to 1,400 ug/g), toluene (76 to 8,300 ug/g), vinyl chloride (26 to 49 ug/g), polynuclear aromatics (PNAs) such as naphthalene, and metals. No records have been reviewed on the total volume of waste placed in the basin. The Surface Impoundment currently contains approximately 5.5 million gallons (MG) of aqueous waste and sludge.

Two recent studies performed at the site of the Surface Impoundment include the following:

1. "Report of Subsurface Exploration and Preliminary Ground Water Monitoring Program, Air Force Plant No. 6 Disposal Basin," dated Mar. 17, 1981 (Law, 1981); and
2. "Groundwater Quality Assessment Report, Surface Impoundment (Industrial Waste Sludge Disposal Basin)," dated Oct. 10, 1984 (Wilson and Co., 1984).

In November 1980, RCRA became effective. In this regulation (40 CFR, Parts 265.90 through 265.94), installation of monitoring wells and ground-water monitoring are required to determine if surface water impoundments are leaking. Law was contracted in 1981 by Lockheed-Georgia Co. to develop and implement a RCRA ground-water-monitoring program. Law installed five monitoring wells (B-1, B-2, B-3, B-4, and B-5) as shown in Fig. 2.5-1. These wells were designed to encompass at least one upgradient and three downgradient monitoring wells to meet RCRA requirements. Monitoring Well B-1 was the initial upgradient well, but subsurface debris interfered with sampling the well, and an additional well (B-5) was installed to replace B-1. Through 1983, ground-water samples were collected and analyzed according to EPA-approved methods and procedures by Chester Engineers. Statis-

tically significant differences in concentrations of contaminants between the upgradient well and the downgradient wells were observed.

In November 1983, Chester Engineers prepared a ground-water-assessment plan for the Surface Impoundment in accordance with the requirements of Chapter 391-3-11-10 of the Georgia Rules for Hazardous Waste Management [40 CFR Part 265.93(d)(3)]. The plan was submitted to Georgia EPD by Lockheed-Georgia Co. On Apr. 19, 1984, the ground-water-assessment plan, as specified in Item 2 of the Consent Agreement dated Apr. 19, 1984, between Lockheed-Georgia Co., Georgia EPD, and USAF was implemented by Wilson and Co. Wilson and Co. subcontracted Dixie Well Boring Co. to install 17 additional shallow-monitoring wells and 3 additional bedrock wells in the study area (Fig. 2.5-1). Shallow-monitoring wells include Wells B-6, B-7, D-1 through D-7, and E-1 through E-8. Wells D-1 through D-7, E-2, E-3, E-4, E-7, and E-8 are located on DAFB. Bedrock monitoring wells include BR-1, located upgradient of the Surface Impoundment, and Wells BR-2 and BR-3 situated downgradient of the Surface Impoundment.

In addition to installing monitoring wells, test borings were made in and near the Surface Impoundment. Borings were drilled, and piezometers were installed as part of a geotechnical investigation (Hanson, 1984) to determine the structural integrity and seepage conditions for the Surface Impoundment (see Fig. 2.5-1) dike. Field investigations by Wilson and Co. included soil borings, electrical-resistivity soundings and profiles, and ground-water sampling and chemical analysis.

Several hydrogeologic cross sections are shown in Figs. 2.5-4 through 2.5-6 to show the conditions encountered at selected boring locations. Fig. 2.5-7 shows the cross-section locations.

The borings in the immediate area of the Surface Impoundment, B-1 through B-4, generally encountered fill materials to depths ranging from about 12 to 23 ft. The fill typically consisted of silty sands with numerous organic material (i.e., wood chips, paper, and wood debris). Residual soils, typically silty sands, were encountered beneath the fill

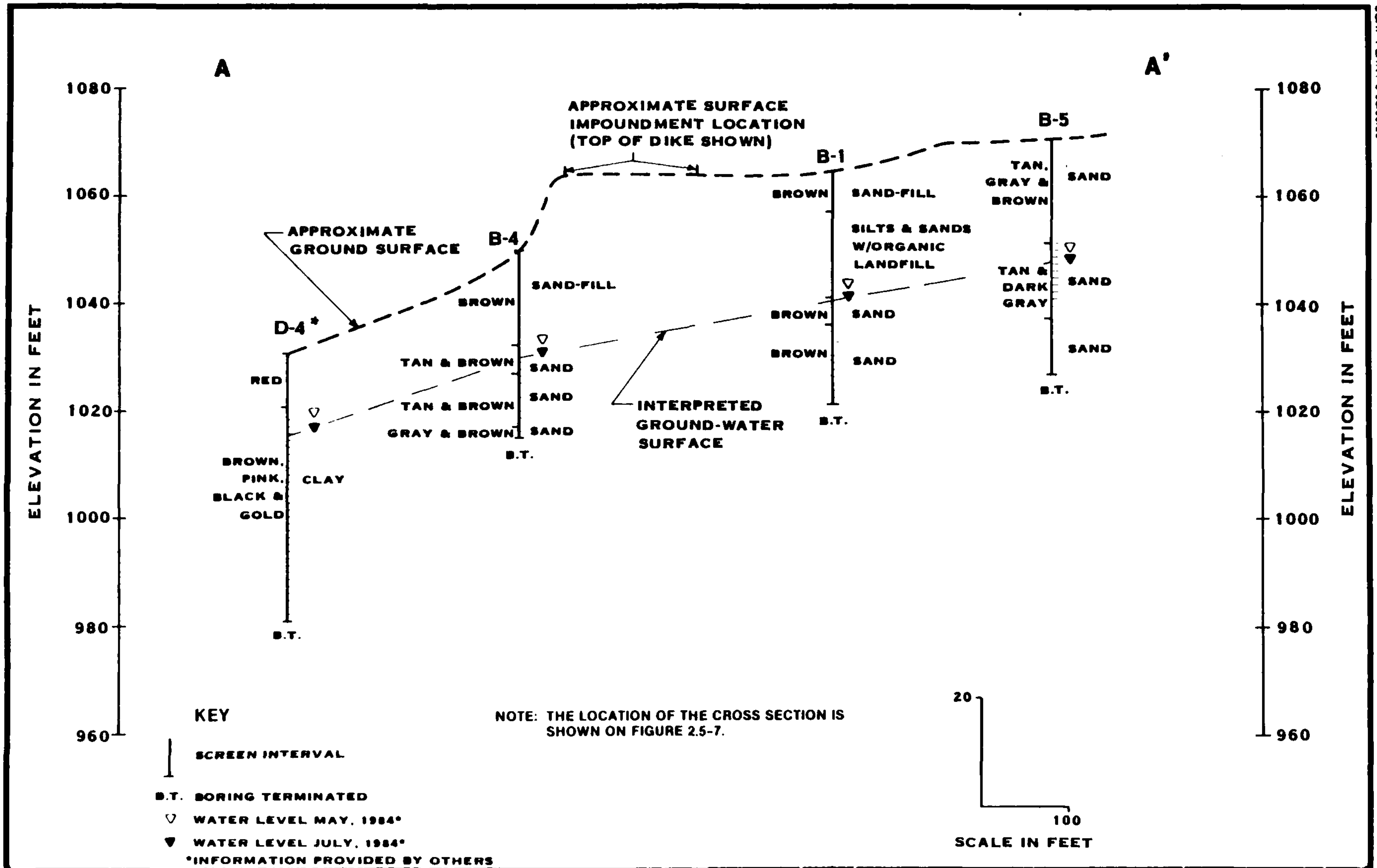

Figure 2.5-4
INTERPRETED HYDROGEOLOGIC SECTION A-A' AT SITE G1—SURFACE IMPOUNDMENT AND SITE G3—PAST LANDFILL

SOURCE: LAW, 1985.

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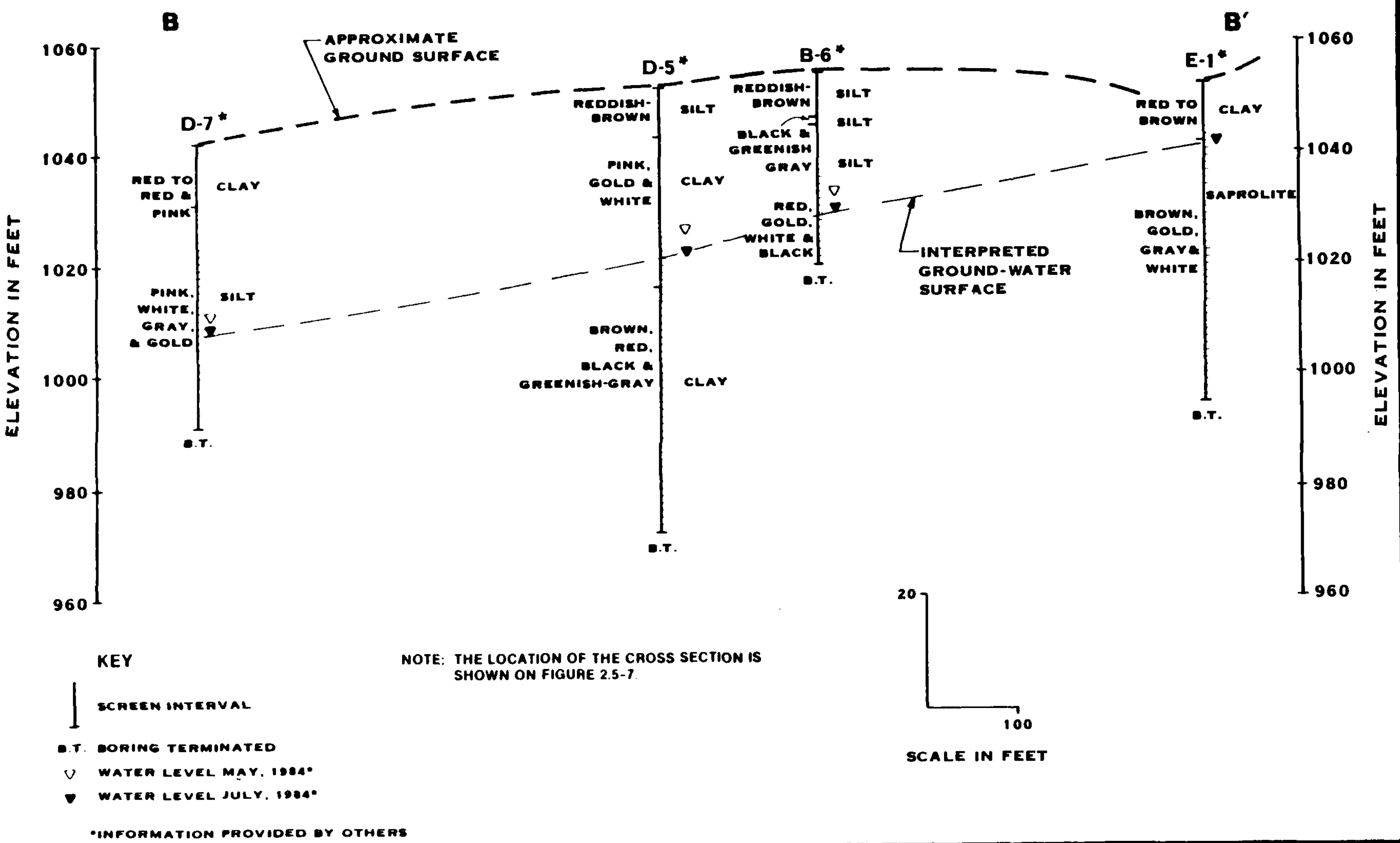

Figure 2.5-5
INTERPRETED HYDROGEOLOGIC SECTION B-B′ AT SITE G1—SURFACE IMPOUNDMENT AND SITE G3—PAST LANDFILL

SOURCE: LAW, 1985.

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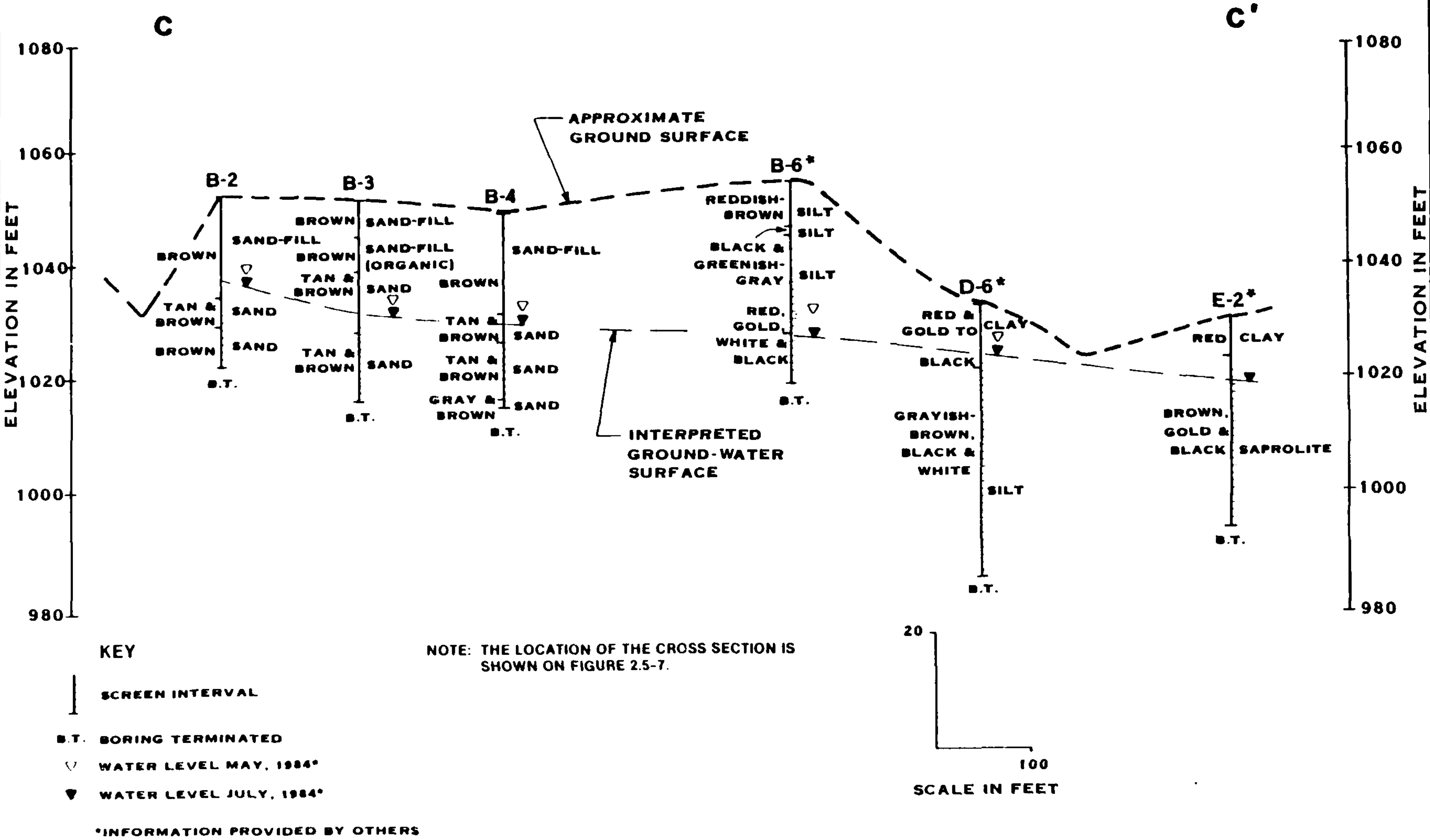

Figure 2.5-6
INTERPRETED HYDROGEOLOGIC SECTION C-C' AT SITE G1—SURFACE IMPOUNDMENT AND SITE G3—PAST LANDFILL

SOURCE: LAW, 1985.

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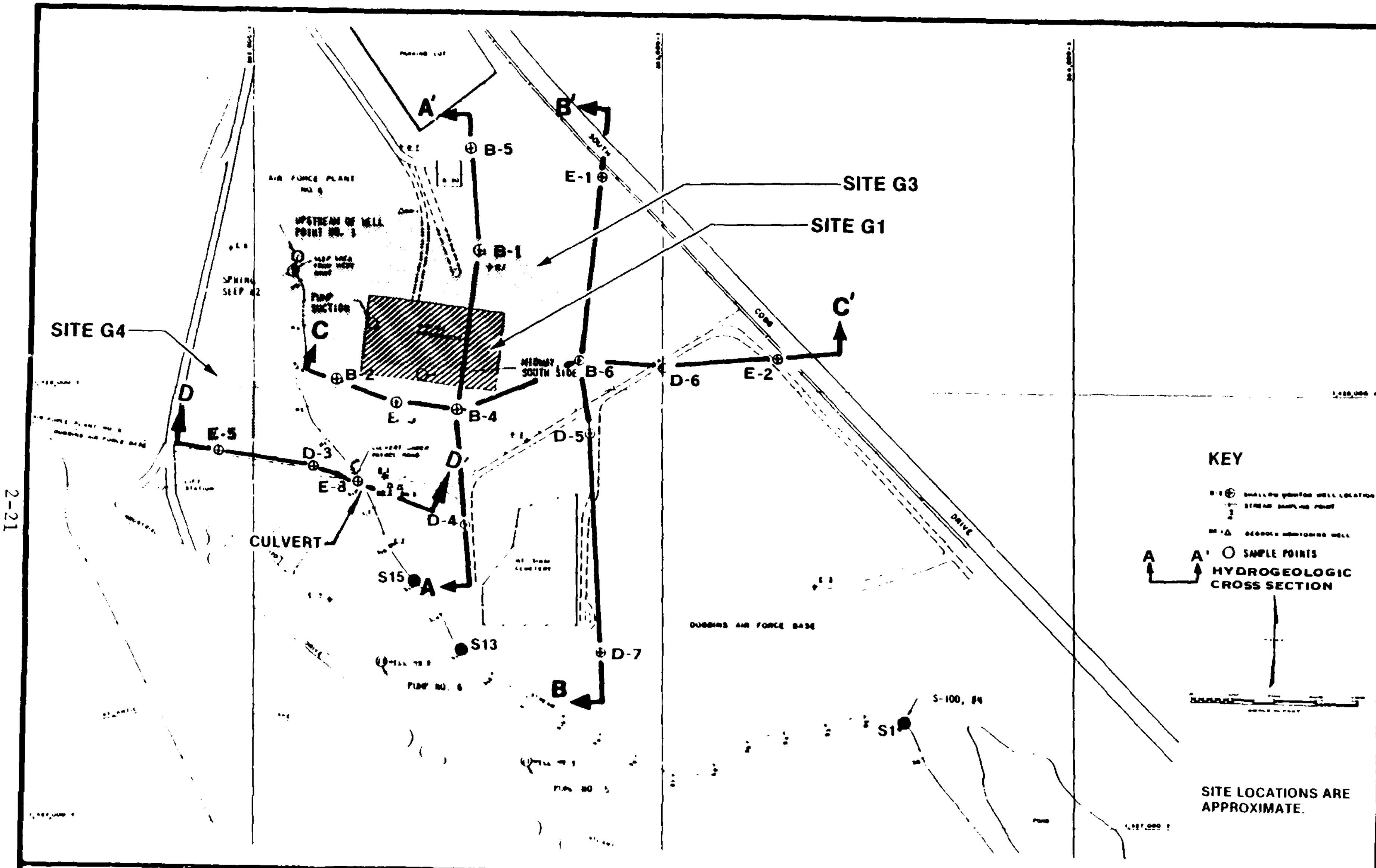

Figure 2.5-7
CROSS-SECTION LOCATIONS FOR INDUSTRIAL WASTE LAND DISPOSAL AREA

SOURCE: WILSON AND CO., 1984

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and from near the ground surface in borings farther away from the impoundment. Partially-weathered rock (i.e., residual material with a penetration resistance near 100 blows per ft) was present in some of the borings below a depth of about 30 ft. Refusal to soil-drilling methods (auger) was encountered by two of the impoundment-area borings at depths of about 43 ft. Other borings further from the impoundment encountered refusal at depths ranging from about 27 to 67 ft.

Ground-water levels noted in borings B-1 through B-5 in January 1981 and July 1984 varied from about 17 to 29 ft below the ground surface (corresponding to elevations of about 1,026 to 1,071 ft). Based on these readings, ground-water movement in the impoundment area appears to flow to the south and southeast. The water-level data indicate that the ground-water surface may periodically be in contact with the landfilled materials and the sludge in the impoundment. Hydrologic and chemical data presented by Wilson and Co. indicated that a ground-water mound occurs at the southeast corner of the Surface Impoundment, and flow velocities range from 17 to 70 ft per year. A contamination plume is believed to have extended approximately 600 ft to the southeast. The plume discharges to the stream as far downstream as Station S-15.

Site G3--Past Landfill (Zone 1)

The Past Landfill is south of the Radome Building (B-90) in the same general area as the Surface Impoundment (Site G1) (Fig. 2.5-7). The landfill reportedly was used prior to construction of the Surface Impoundment as a disposal area for construction rubble. Reportedly, each layer of landfill material, approximately 2 ft thick, was covered with about 1 ft of clayey soil. The landfill was reportedly closed in 1972. CH2M Hill reports medium quantities of sealants, paints, and adhesives may have been disposed of in this area from about 1970 to 1972.

Recent studies in the Past Landfill area have included two previously discussed reports addressing the Surface Impoundment (Law, 1981; Wilson and Co., 1984).

Ground cover at the site consists of exposed soils, waste material, and scattered grass. Some trees are present along the perimeter of the landfill area. Since the Surface Impoundment area overlaps the Past Landfill site, the subsurface conditions in the area are generally as described for Site G1.

Site G4--Sanitary WWTP Sludge Disposal Area (Zone 1)

The Sanitary WWTP Sludge Disposal Area is about 200 ft west of the Surface Impoundment and is located east of 6th St. and Bldg. B-64, the Electronics Laboratory. Reportedly, this area has been used since 1951 for disposal of all anaerobically digested, dewatered sludge from the Sanitary WWTP. The Sanitary WWTP Sludge Disposal Area reportedly receives about 500 cubic yards (yd^3) of sludge per year. The sludge may contain heavy metals and organics, since powdered activated carbon (PAC) is mixed with the sludge (CH2M Hill, 1984). According to Chester Engineers, the sludge is not classified as a hazardous waste. Samples dated July 23, 1984, indicate that high levels of total chromium (4,150 and 4,880 mg/l) and lead (228 and 212 mg/l) are present in soil but are not leachable based on EP toxicity test results. Results of EP toxicity tests conducted by Chester Engineers on samples from Sanitary Sludge Areas I and II (see page Q-380 of App. Q) were all below the threshold concentrations for hazardous substances.

Figs. 2.5-1 and 2.5-7 show the monitoring-well location and sampling locations for Site G4.

The study performed by Wilson and Co. for the Surface Impoundment provided some information pertaining to the sludge-disposal area. The October 1984 Wilson and Co. report included the results of three borings (D-3, E-5, and E-8) drilled downgradient of the sludge-disposal area, electrical-resistivity profiles along the perimeter of the sludge-disposal area, and ground-water sampling and chemical analyses. Each of these wells is contaminated with chlorinated organics.

The topography of Site G4 generally slopes from west to east toward a drainage swale along the eastern edge of the site. A topographic site plan, dated February 1959, indicates a difference in elevation of approximately 50 ft across the site (horizontal distance of approximately 280 ft).

A hydrogeologic-cross section in Fig. 2.5-8 shows the conditions encountered at selected boring locations. The borings in the sludge disposal area (D-3, E-5, and E-8) generally encountered soils described as silts or clays in the upper 6 ft. An upper 2 ft of organic matter, however, was penetrated by one of the borings at the ground surface. Beneath the upper-clayey soils, the boring records indicate saprolitic soils. These soils are likely silty sands with various amounts of clay based on the soil descriptions of other borings in the Surface Impoundment (Site G1) area. Auger refusal was encountered by the borings at depths ranging from 45 to 52 ft below the ground surface.

Ground-water levels noted in the three borings during 1984 varied from less than 1 ft to about 32 ft below the ground surface. The relatively shallow ground-water level was noted in boring D-3, the topographically lowest of the three borings. Based on these data, ground-water movement in the sludge disposal area appears to flow to the southeast towards the unnamed stream. The water-level data indicate the ground-water surface is located within the residual soils.

2.5.2 INDUSTRIAL FACILITIES, ACTIVE LANDFILL, AND STORMWATER RETENTION BASIN NO. 2 (ZONE 2)

This drainage zone encompasses Site G9 (TCE Spill at B-76), Site G8 (Bldg. B-96 Complex), Site G2 (Active Landfill), and Site G5 (Stormwater Retention Basin No. 2).

Chester Engineers prepared a report entitled "Report on Environmental Site Assessments," dated Nov. 8, 1984, which presents the findings of their investigation concerning the TCE Spill at B-76. This study included installation of six monitoring wells (MW26 to MW31)

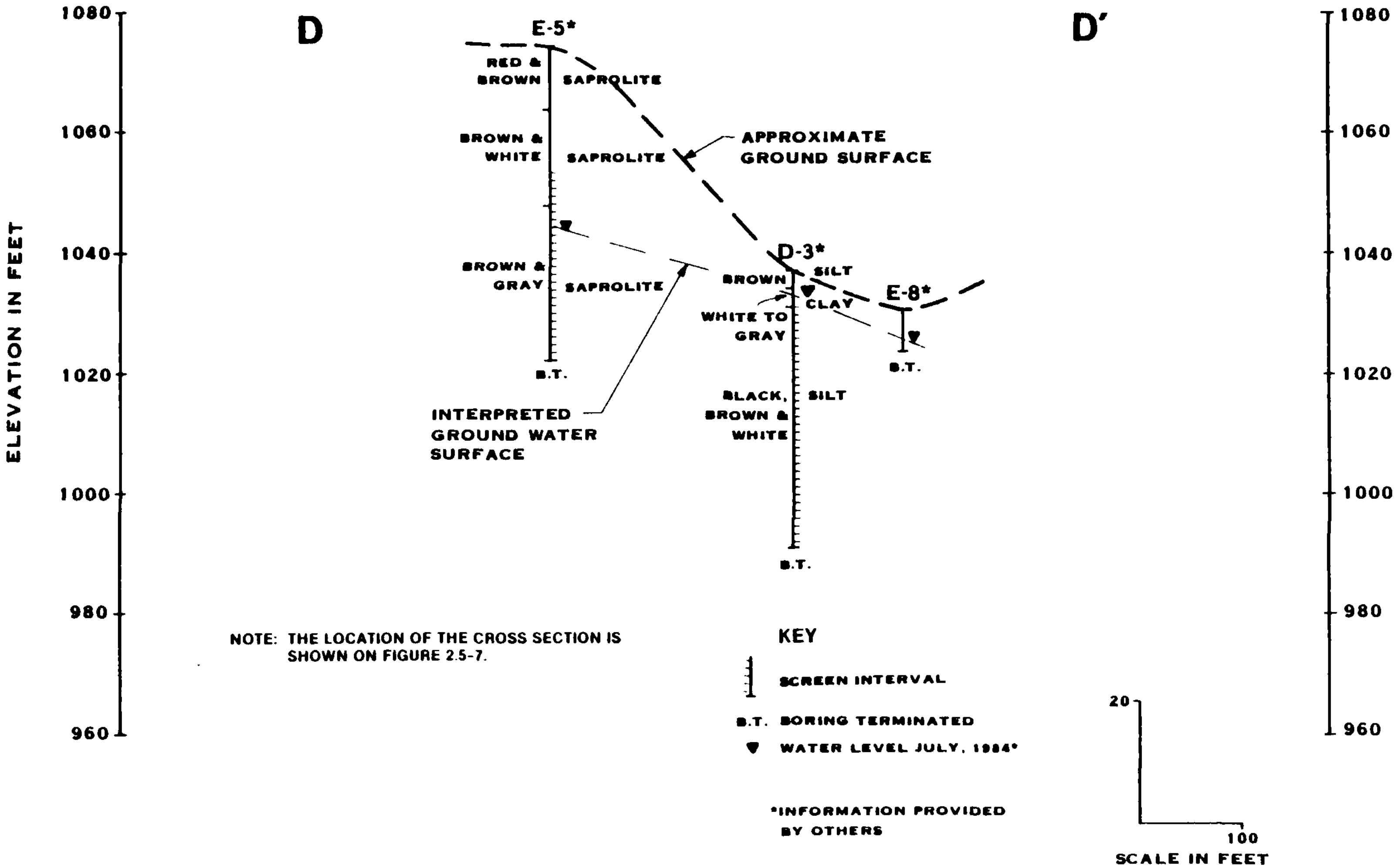

Figure 2.5-8
ZONE 2, INCLUDING INTERPRETED HYDROGEOLOGIC SECTION D-D′ AT SITE G4—SANITARY WWTP SLUDGE DISPOSAL AREA

SOURCE: LAW, 1985.

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located throughout the study area as shown in Fig. 2.5-9. Chemical analyses were performed on ground-water samples from the wells, and a sediment sample was obtained from the sedimentation pond located at the toe of the landfill. This report includes the results of a site reconnaissance, field permeability tests (Hvorslev slug and drawdown/recovery), and the water and sediment chemical-analysis data.

The hydrologic section A-A' presented in Fig. 2.5-10 and the ground-water contours presented in Fig. 2.5-11 give an overview of hydrologic conditions within this drainage area.

Site G9--TCE Spill at B-76 (Zone 2)

A TCE spill occurred on Mar. 22, 1983, in the chemical lot to the east of Bldg. B-76 (Fig. 2.5-9). The spill occurred during the off-loading of 10,000 gal of TCE from a tank car to a 14,000-gal aboveground storage tank. The spilled TCE apparently leaked from an underground transfer pipeline while being pumped from the tank car. TCE was later noted emerging through the asphalt pavement and subsequently entered a storm drain beneath the TCE storage tank.

Estimates indicate that approximately 1,066 gal of TCE was spilled, with about one-half of that amount flowing to the Stormwater Retention Basin No. 2 (Site G5). The remainder of the spilled TCE was assumed to have entered the soil in the area of the spill. Aeration and granular carbon filters helped reduce levels of TCE in the Stormwater Retention Basin No. 2 as the Spill Prevention Control and Countermeasure (SPCC) Plan was implemented. Ground water sampling and analysis of MW5 and MW6 have shown TCE contamination ranging from 2,045 to 5,195 ug/l in the ground water.

A minor TCE spill (approximately a few gallons) reportedly occurred on Feb. 24, 1984, at the TCE transfer station located along the railroad track west of Bldg. B-99. The TCE reportedly flowed across a paved area and entered a storm drain which flows to the Stormwater Retention Basin

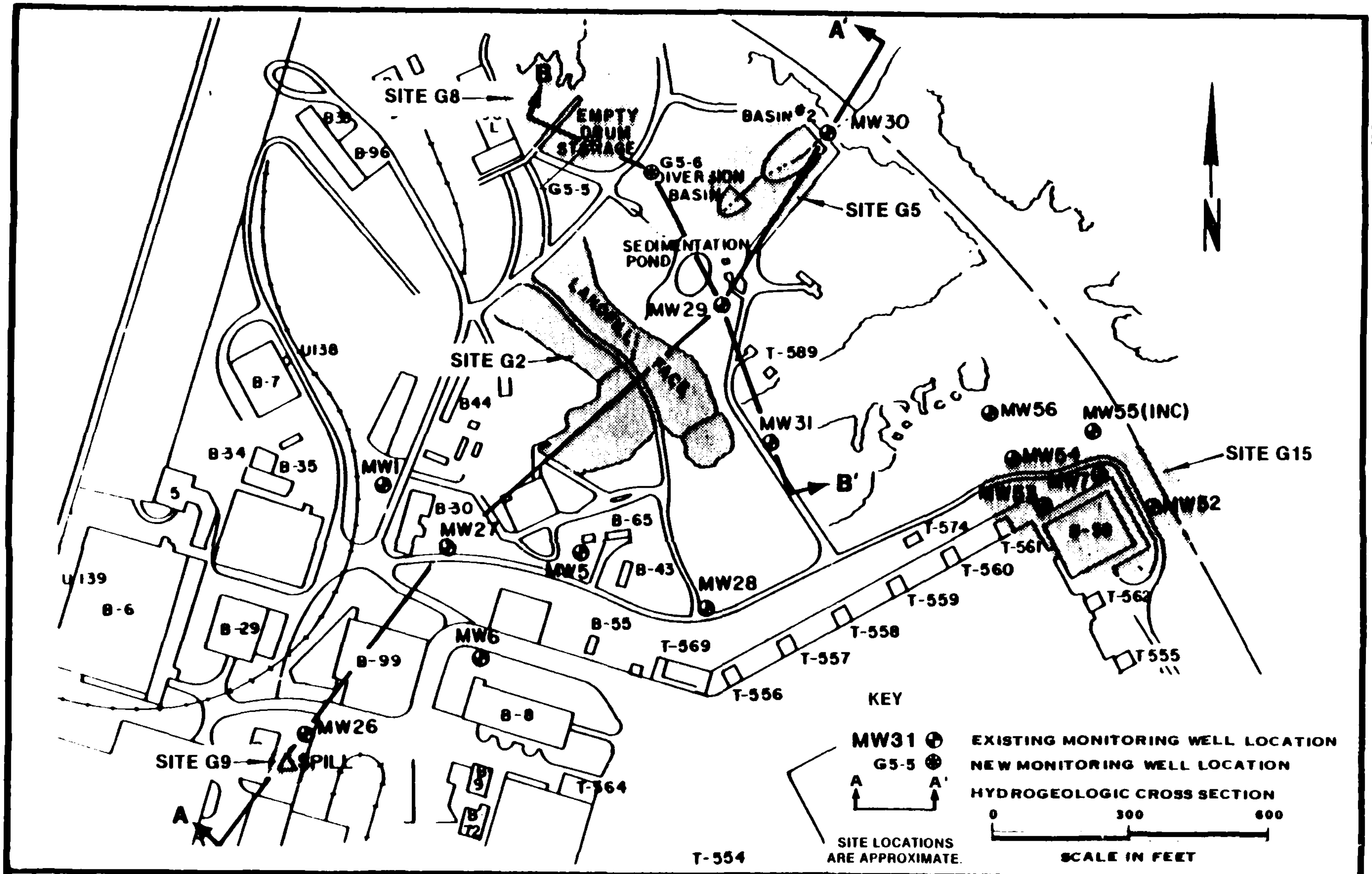

Figure 2.5-9
MONITORING WELL LOCATION PLAN FOR INDUSTRIAL FACILITIES, ACTIVE LANDFILL, AND STORMWATER RETENTION BASIN NO. 2

SOURCE THE CHESTER ENGINEERS, 1984

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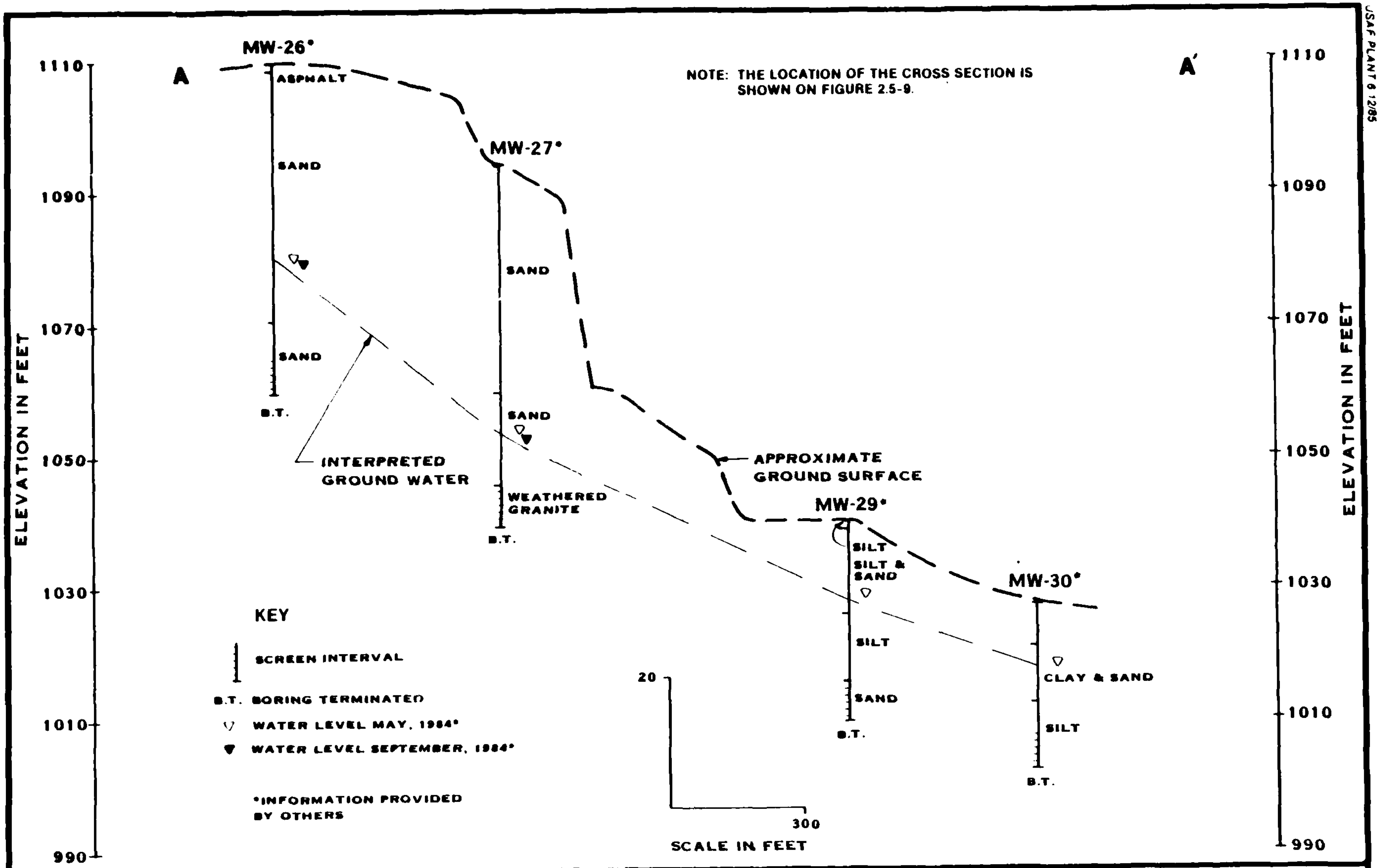

Figure 2.5-10
INTERPRETED HYDROGEOLOGIC SECTION A-A' FOR ZONE 2, INCLUDING INDUSTRIAL FACILITIES, ACTIVE LANDFILL, AND STORMWATER RETENTION BASIN NO. 2
SOURCE: LAW, 1985.

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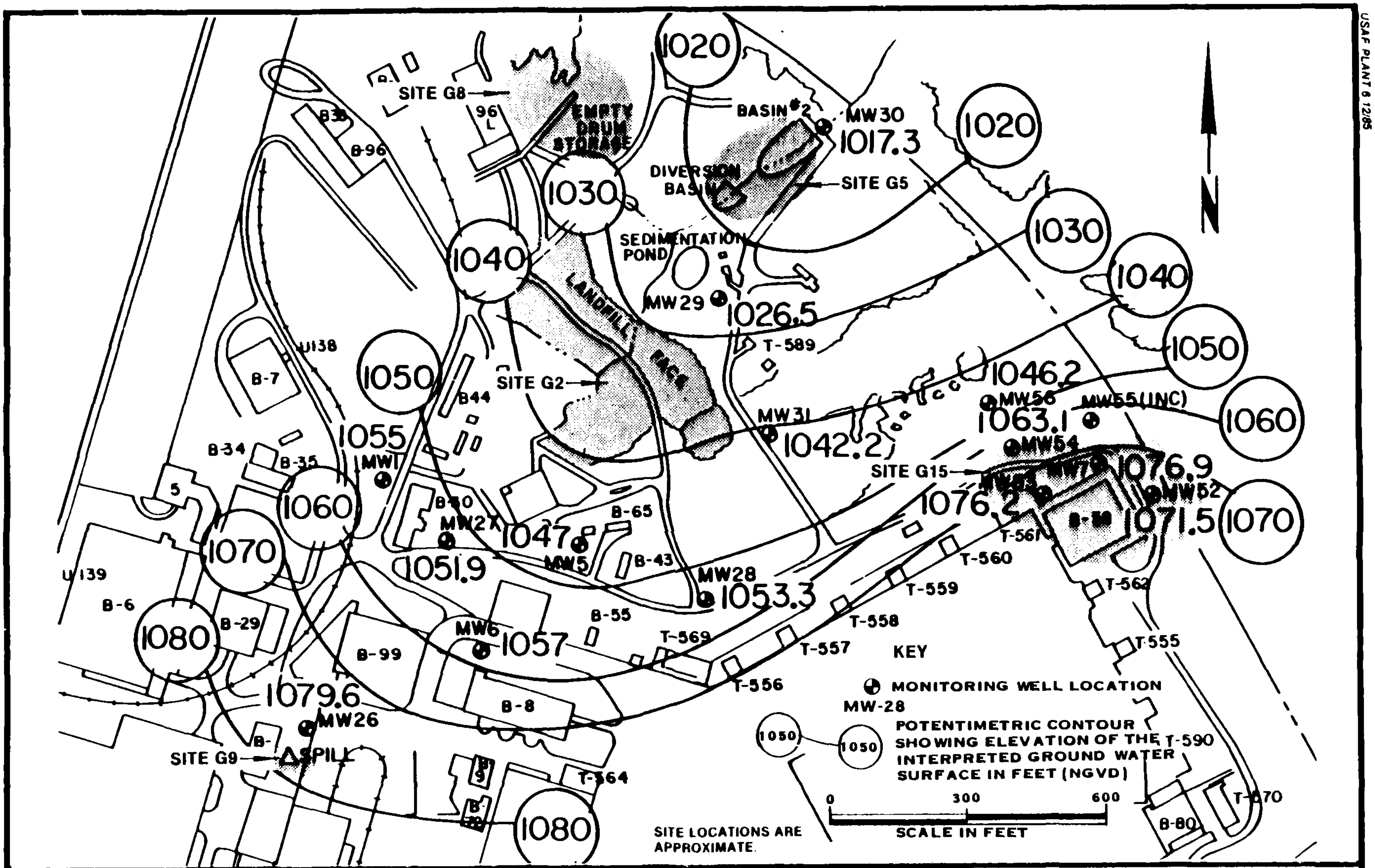

Figure 2.5-11
INTERPRETED GROUND WATER CONTOURS FOR ZONE 2, INCLUDING INDUSTRIAL FACILITIES, ACTIVE LANDFILL, AND STORMWATER RETENTION BASIN NO. 2
SOURCE: THE CHESTER ENGINEERS, 1984.

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No. 2. No action was taken to contain or recover TCE from the soil (Chester Engineers, 1984).

The topography in the area of the spill generally slopes to the north from about elevation 1,109 to 1,007 ft, NVGD. Asphalt or concrete pavement is present at the ground surface in this area. Major surface drainage appears to be directed to a drop inlet located beneath the TCE storage tank.

The majority of borings at the site encountered soils described as sands and silts. Some clays were also noted in a few of the borings. No rock was encountered by the majority of borings to the 25- to 55-ft termination depths. However, rock or weathered rock was noted in borings MW1, MW5, and MW26 at depths ranging from about 25 to 49 ft. Ground-water levels in the monitoring wells were reported at depths ranging from about 30 ft in the area of the TCE spill to about 9 ft in the area of Stormwater Retention Basin No. 2.

The major direction of ground-water movement at the site appears to be to the north-northeast, generally corresponding to the direction of the swale draining to the Stormwater Retention Basin No. 2. Ground-water levels noted in the monitoring wells indicate the ground-water surface to be within the residual soils at the site.

Site G8--Bldg. B-96 Complex (Zone 2)

Bldg. B-96L (Slosh Building) is approximately 600 ft west of the Stormwater Retention Basin No. 2 (Site G5). The area behind Bldg. B-96L was identified during the IRP Phase I study as possibly being used for disposal of approximately 20 gal per month of sealants, paints, and solvents during the period 1968 to 1970. Currently, the area east-southeast of Bldg. B-96L is used to store empty solvent drums. Soils in this area are discolored.

The Bldg. B-96 Complex was considered by CH2M Hill not to present a significant environmental concern. Therefore, no additional sampling or analysis was recommended during the Phase I study. No additional field monitoring or sampling was proposed in the area of the Bldg. B-96 Complex due, in part, to the proximity of the Bldg. B-96 Complex to other sites [the Active Landfill (Site G2) and the Stormwater Retention Basin No. 2 (Site G5)] previously investigated.

The Chester Engineers collected two surface soil samples in the drum storage area near Bldg. B-96L. The results of the chemical analyses performed on the samples are contained in "Report on Environmental Site Assessments" dated Nov. 8, 1984. These samples contained 41 and [illegible] ppb of methylene chloride as the most significant organic detected.

As part of Phase II studies, two new ground-water-monitoring wells (G5-5 and G5-6) were installed downgradient of the Bldg. B-96 Complex. These new wells were installed as a part of the study of the Stormwater Retention Basin No. 2 (Site G5).

The topography in the area of the Bldg. B-96 Complex generally slopes to the south-southwest to a drainage swale. This portion of the plant includes scattered grassed areas, some gravel-covered areas, and a few paved areas.

Borings G5-5 and G5-6, east of Bldg. B-96, typically encountered 4 to 7 ft of clay and silt fill (see Test Boring Records in App. F). The consistency of the fill soils ranged from soft to firm. Beneath the fill, the borings generally encountered firm to dense silty fine sands to the boring termination depths of 50 and 37 ft, respectively.

Upon completion of drilling, the depth to ground water in boring G5-5 was approximately 35 ft (see Sec. 3.0 for further data). This water level and water levels recorded for other borings in the general area of Bldg. B-96 indicate the ground water surface to be in the residual

soils. The permeability measured in Well G5-5 is 1.2 x 10^{-4} cm/sec, which is representative of the silty fine sands in the area.

The water-level data indicate ground-water movement is generally to the east, toward the sedimentation pond in the drainage swale.

Site G5--Stormwater Retention Basin No. 2 (Zone 2)

Stormwater Retention Basin No. 2 is located adjacent to South Cobb Dr. and the installation boundary, approximately 400 ft north of and downgradient from the Active Landfill (Site G2) (Fig. 2.5-9). The basin reportedly was constructed in 1977 for spill containment and has been used on two occasions to reduce the migration of contaminants off the installation. The most recent spill occurred on Mar. 22, 1983, when approximately 1,066 gal of TCE spilled in the B-76 parking lot. The spill occurred during the transfer of 10,000 gal of TCE from a tank car to the 14,000-gal aboveground storage tank. TCE-contaminated water reportedly entered Stormwater Retention Basin No. 2, and two surface aerators were installed to remove TCE from the water prior to being discharged from the basin. The Stormwater Retention Basin No. 2 has a surface area of 0.5 acre and collects runoff from the vicinity of the Active Landfill (Site G2).

Surface drainage from the TCE Spill at B-76 (Site G9) flows through the swale and then into the Stormwater Retention Basin No. 2 (Site G5). A sedimentation pond, located at the toe of the Active Landfill, is upgradient of Stormwater Retention Basin No. 2 and receives drainage from Bldg. B-96 Complex (Site G8) and the Active Landfill (Site G2). The ground cover in the general area of the retention basin is predominantly grass with portions being wooded.

The Phase I report (CH2M Hill, 1984) recommended the installation of a ground-water-monitoring well at the plant property line to determine if contaminated ground water was leaving the site. Also, the report recommended sampling the basin influent and effluent on a monthly basis

to determine the amount of volatile organic compounds present in the water.

Wells MW29 and MW30, which were installed upgradient and downgradient, respectively, of Stormwater Retention Basin No. 2, meet this specification. These borings typically encountered firm to stiff silts above firm silty sands. These wells were drilled to depths of about 25 to 30 ft. The sand noted in MW29 below 24 ft was described as weathered granite, indicating that the wells were finished in the transition zone above bedrock.

Two test borings (G5-5 and G5-6) were drilled by ESE during this phase of investigation of Site G5. They ranged in depth from 36.5 to 50.5 ft, respectively. More detailed descriptions of soil types and well construction data are found in App. F and Sec. 3.0.

The ground-water level in Well MW30 noted in May 1984 was about 10 ft below the ground surface (corresponding to approximately 1,018 ft). The water levels reported in the other wells indicate ground-water movement generally to the northeast, corresponding to the direction of surface flow in the drainage swale. The water-level readings also indicate that the ground-water surface is in contact with the residual soils.

The hydraulic gradient of 0.04 exists across the site. Field permeability tests of wells (see Sec. 3.0 and App. I) at Site G5 range from 1.2×10^{-4} cm/sec (Well G5-5) to 1.4×10^{-4} cm/sec (Well G5-6). These compare with the laboratory permeability results shown in Sec. 3.0. The average hydraulic conductivity (k) tested in the 17 wells is 1.3×10^{-4} cm/sec.

The ground-water-flow velocity can be calculated using the formula from Darcy's Law:

$$v = ki/Ne$$

where: v = velocity (cm/sec),
k = hydraulic conductivity (cm/sec),
i = hydraulic gradient, and
Ne = effective porosity (dimensionless).

An approximate flow velocity at Site G5 can be calculated with the following data:

1. An average hydraulic conductivity (k) of 1.3×10^{-4} cm/sec,
2. A measured hydraulic gradient (i) of 0.04, and
3. An assumed effective porosity (Ne) of 0.20, based on the lithologic characteristics of sediments present in this area.

Based on the previous data, a ground-water-flow velocity of approximately 2.6×10^{-5} cm/sec (27 ft/year) is calculated for Stormwater Retention Basin No. 2 (Site G5).

<u>Site G2--Active Landfill (Zone 2)</u>

The Active Landfill is approximately 700 ft upgradient of the Stormwater Retention Basin No. 2 (Site G5) and approximately the same distance downgradient from the TCE Spill at B-76 (Site G9) (see Fig. 2.5-9). Reportedly, the Active Landfill primarily receives construction-related debris; however, during the 1950s and possibly the 1960s some waste engine oils, fuels, and solvents were deposited in the landfill. The plan area of the landfill is approximately 3 acres.

The Phase I study (CH2M Hill, 1984) recommended that two ground-water-monitoring wells be installed at the site, one upgradient and one downgradient of the landfill. These wells were installed by Chester Engineers.

The ground-water level in the downgradient well, MW29, in May 1984 was reportedly approximately 12 ft below the ground surface (corresponding to an elevation of 1,028 ft). Based on this reading and water levels noted in the other monitoring wells in the area, ground-water movement appears to be to the north-northwest toward the drainage swale. The

water-level readings also indicate that the ground-water surface is located in the residual soils.

Surface drainage in the area of the Active Landfill is generally to the northwest to a swale which flows into a sedimentation pond located at the toe of the landfill. Effluent from the pond then flows into a diversion structure upgradient of the Stormwater Retention Basin No. 2 (Site G5). Surface runoff from the Bldg. B-96 Complex (Site G8) and the storm sewer which drains the area of the TCE Spill at B-76 (Site G9) reportedly discharge into the diversion structure. The diversion structure provides a means of bypassing the Stormwater Retention Basin No. 2.

The majority of borings at the site encountered soils described as sands and silts. Some clays were also noted in a few of the borings. No rock was encountered by the majority of borings to the 25- to 55-ft termination depths. However, rock or weathered rock was noted in borings MW1, MW5, and MW26 at depths ranging from about 25 to 49 ft.

2.5.3 B-58 WING TANK SEAL TEST FACILITY (ZONE 3)

Site G15

The B-58 Wing Tank Seal Test Facility (Site G15) is located along the northeast perimeter of Air Force Plant 6, 300 ft west of South Cobb Dr. (see Fig. 2.5-9). Operations at Bldg. B-58 include testing of C-130 wing tank seals. The solvent 1,1,1-trichloroethane (TCA) historically has been used in the testing procedures. A drum storage area exists at the northwest corner of the building, and the entire area recently has been paved.

This site is located within the eastern perimeter of the Stormwater Retention Basin No. 2 (Site G5) watershed. The topography is sloped in a northeasterly direction toward Stormwater Retention Basin No. 2. On the northeast side of Bldg. B-58, the topography slopes toward Rottonwood Creek and Wildwood Park. To the southeast of Bldg. B-58, the topography slopes gently to a storm sewer inlet. The storm sewer drains

in an easterly direction toward Rottenwood Creek. The Bldg. B-58 site is on an elevated mound with drainage flow to the north and west.

Well MW7 was sampled by Chester Engineers on Mar. 2, 1984, as part of the preliminary survey of wells due to the TCE Spill at B-76 (Site G9) in the Stormwater Retention Basin No. 2 drainage area. The well was not expected to be contaminated, since ground-water elevations were higher than the TCE Spill at B-76 (Site G9). However, TCA (13,300 ug/l), dichloroethylene (2,920 ug/l), and TCE (54 ug/l) were present. The source of these compounds is unknown. One possibility is that an historic accumulation of minor leakage and spillage caused the contamination.

Sampling of MW7 as part of the initial reconnaissance well sampling in the Stormwater Retention Basin No. 2 area revealed an isolated potential contamination location with high concentrations of TCA. However, no leads to specific contamination incidents could be related to this site. Chester Engineers then proceeded with the installation of additional monitoring wells as follows:

1. MW02: East side of B-58 in a lateral dispersive position;
2. MW03: Northeast side, 50 ft downgradient of current drum storage area;
3. MW04: At the edge of the concrete storage pad in an intermediate downgradient position;
4. MW05: Downgradient of the property line (incomplete due to auger refusal); and
5. MW06: A far downgradient position.

These wells were sampled on Aug. [illegible] and 21, 1984 (along with MW7), and analyzed for volatile organic compounds. TCE and TCA were detected in all wells (see Fig. [illegible]). A potential exists for contaminated ground water to flow off DAFB property to the north.

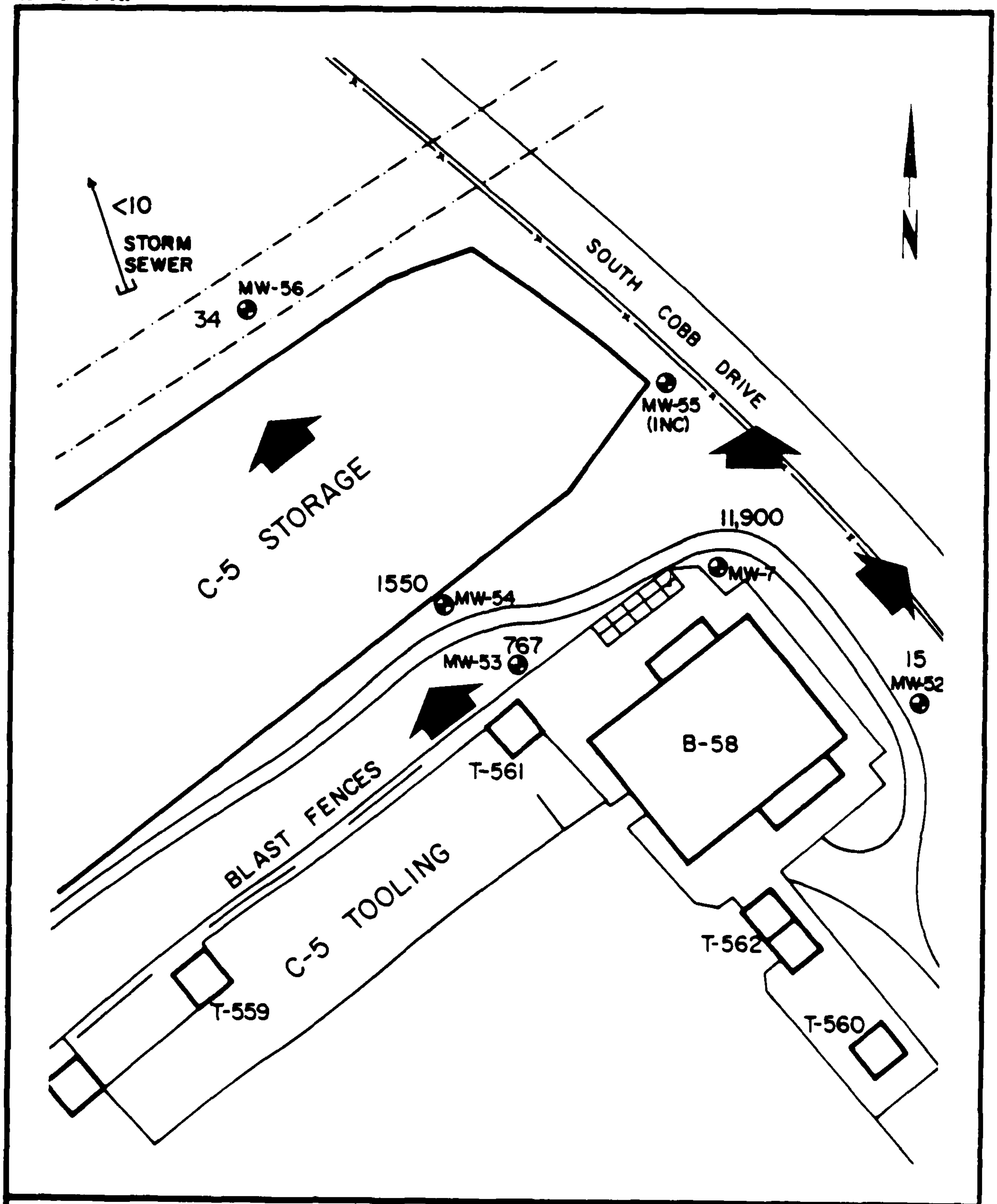

Figure 2.5-12
ZONE 3, INCLUDING SITE G15 (B-58 WING TANK SEAL TEST FACILITY) GROUND WATER FLOW AND 1,1,1-TRICHLOROETHANE CONCENTRATION (ug/l) ON AUG. 20, 1984

SOURCE: THE CHESTER ENGINEERS, 1984.

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Wildwood Park, immediately north of Site G15 across South Cobb Dr. at New Gate 6 and operated by the city of Marietta is probably downgradient from this site.

2.5.4 INDUSTRIAL WASTE TREATMENT FACILITY (ZONE 4)

This zone includes Site G6 (B-10 Aeration Basin) and Site G10 (JP-5 Fuel Spill No. 2). The location of these sites is shown in Fig. 2.5-13. The Chester Engineers performed an exploration in the B-10 Aeration Basin area entitled, "Report on Groundwater Quality Assessment Plan, Industrial Waste Treatment Facility, B-10 Aeration Basin," dated Nov. 30, 1984. This report contained the results of chemical analyses on sediment and ground water samples obtained at the site, as well as geohydrological data. Data presented in this report indicate that contamination plumes from Site G6 (B-10 Aeration Basin) extend east and south of the basin. These plumes may flow under the area of the JP-5 Fuel Spill No. 2 (Site G10). The relative locations of these sites and monitoring well locations are shown in Fig. 2.5-13, and the hydrogeologic cross sections are shown in Figs. 2.5-14 and 2.5-15. Also shown is the location of a stormwater sedimentation pond that was not reported in the Phase I report. This pond receives stormwater runoff from the IWTP area and also serves as a primary catch basin in the event of spills of bulk liquids during loading/unloading operations at the Chem Mill (Bldg. B-91). Overflow from this catch basin discharges into a 72-inch culvert located under the taxiway east of the site. Water from this culvert flows in a natural channel to Big Lake on DAFB.

<u>Site G6--B-10 Aeration Basin (Zone 4)</u>

The B-10 Aeration Basin now serves as the final treatment step for industrial waste streams treated by the IWTP. It is located about 200 ft east of the Bldg. B-27. The basin is approximately 10 to 15 ft

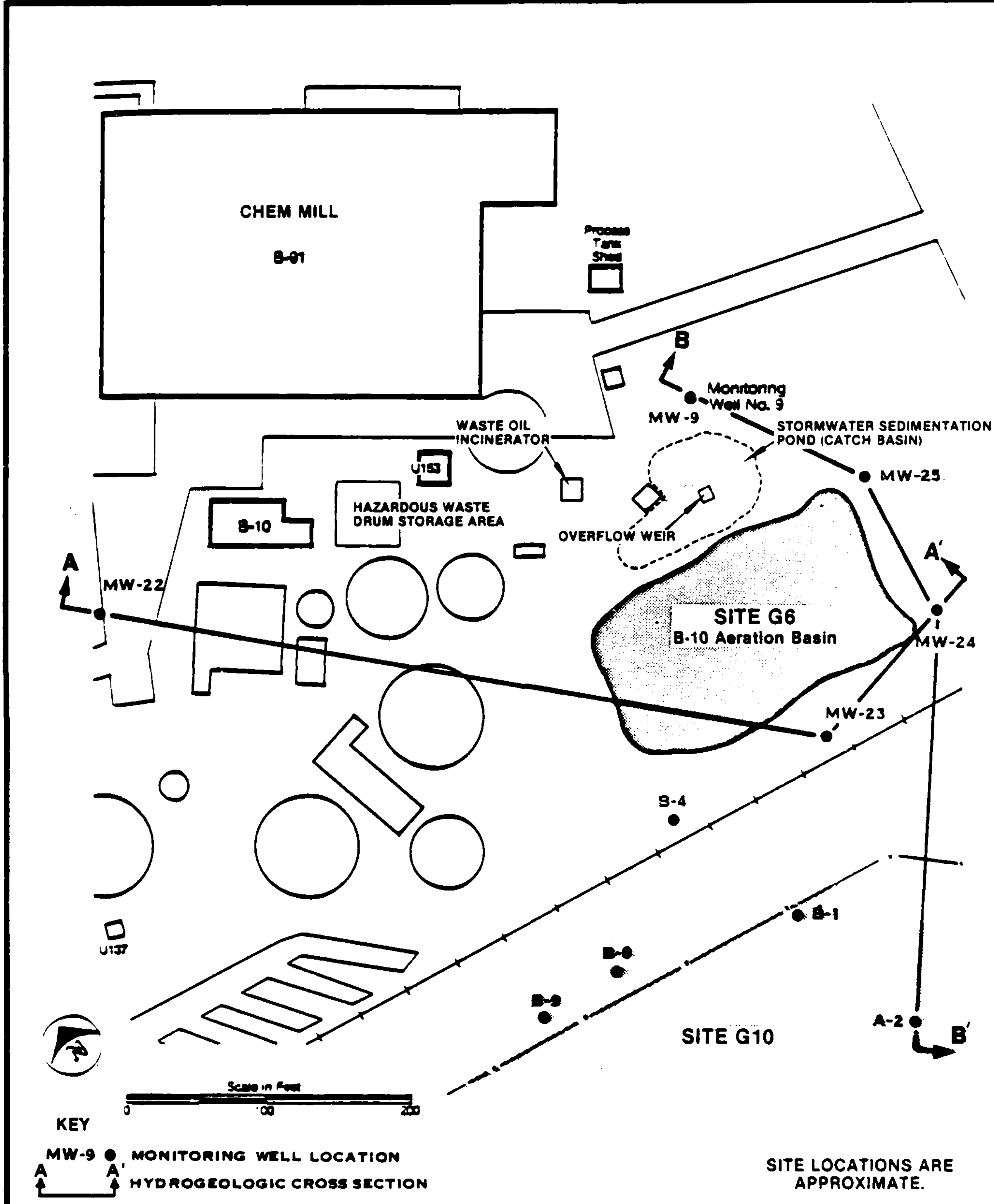

Figure 2.5-13
ZONE 3, INCLUDING MONITORING WELL LOCATION PLAN FOR SITE G6—B-10 AERATION BASIN AND SITE G10—JP-5 FUEL SPILL NO. 2

SOURCE: CH2M HILL, 1984.

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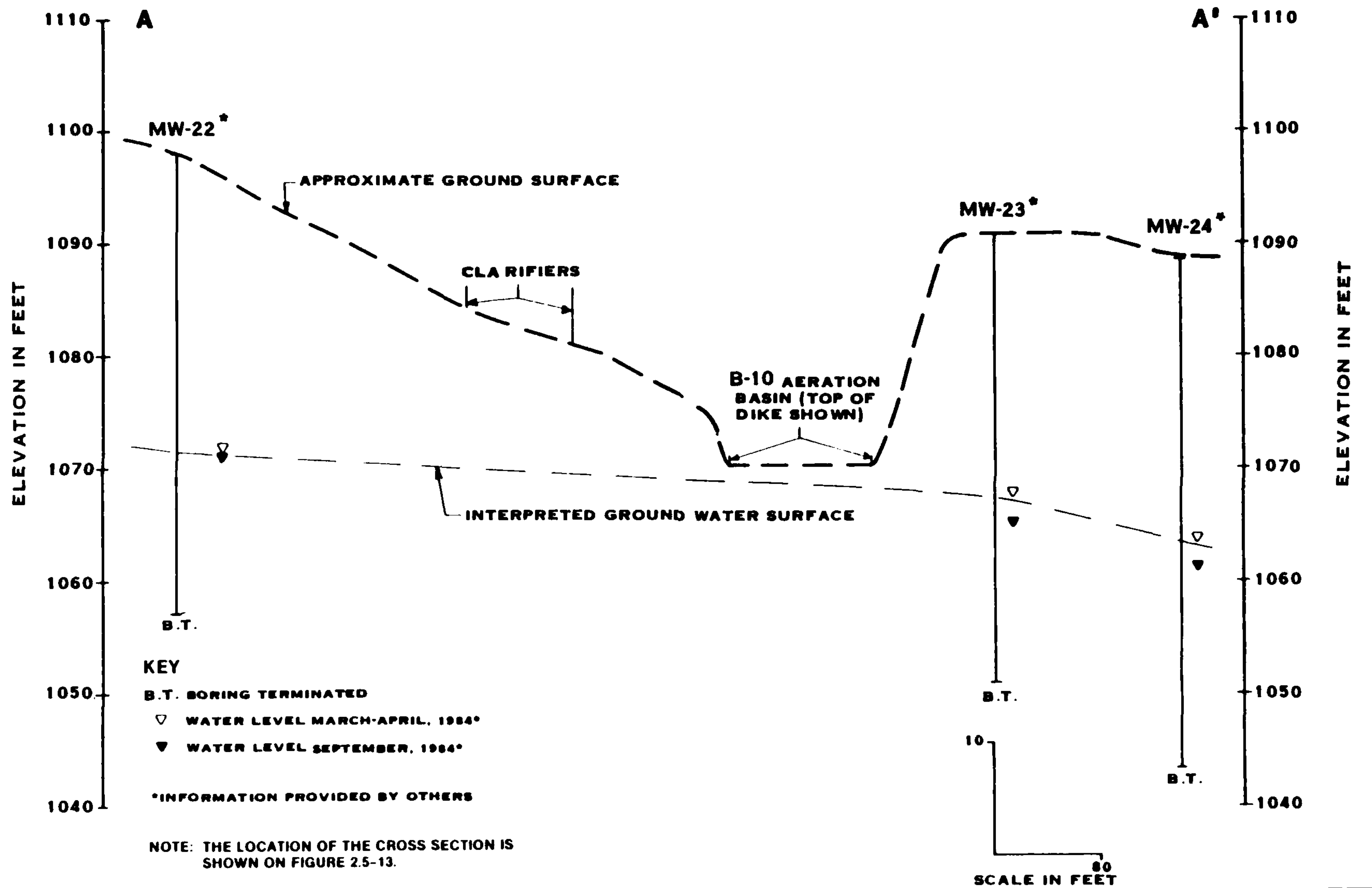

NOTE: THE LOCATION OF THE CROSS SECTION IS SHOWN ON FIGURE 2.5-13.

Figure 2.5-14
INTERPRETED HYDROGEOLOGIC SECTION A-A' FOR SITE G6—
B-10 AERATION BASIN

SOURCE: LAW, 1985.

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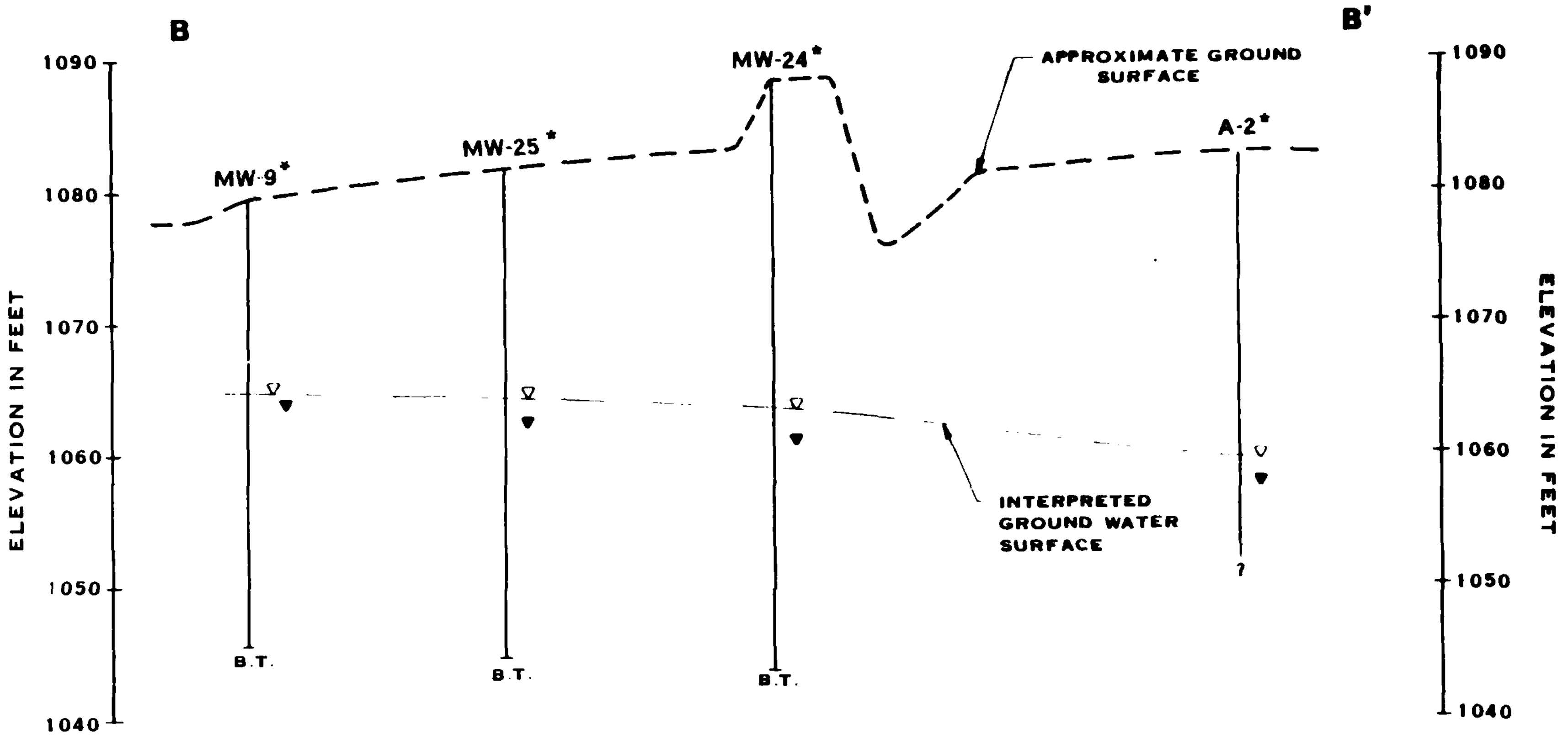
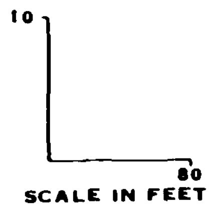


NOTE: THE LOCATION OF THE CROSS SECTION IS SHOWN ON FIGURE 2.5-13.



KEY

B.T. BORING TERMINATED

▽ WATER LEVEL MARCH-APRIL, 1984*

▼ WATER LEVEL SEPTEMBER, 1984*

*INFORMATION PROVIDED BY OTHERS

Figure 2.5-15
INTERPRETED HYDROGEOLOGIC SECTION B-B' FOR SITE G6—
B-10 AERATION BASIN

SOURCE: LAW, 1985

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deep and is unlined. Fig. 2.5-16 shows the B-10 Aeration Basin and the IWTP.

This area has been the site of industrial wastewater treatment operations at Air Force Plant 6 since 1942. The original waste treatment facility was constructed in this area in 1942 and contained only batch treatment for cyanide and chromate. The original plant reportedly included unlined treatment tanks. Wastewater from this treatment process was discharged into Big Lake on DAFB until 1964.

These treatment facilities were rehabilitated to include advanced physical-chemical processes in 1964. In 1972, the processes were upgraded, and the current IWTP was placed in operation. During the 1972 rehabilitation, dredged material from the B-10 Aeration Basin was pumped to the newly constructed Surface Impoundment (Site G1). No rehabilitation of the B-10 Aeration Basin has occurred subsequent to 1972.

During the rehabilitation and construction of the IWTP, a subsurface drain system was installed in the area of the clarifiers. The drains are required to provide structural stability by removing ground water seepage around the clarifiers. Reportedly, the drain pipe extends along the north side of a portion of the B-10 Aeration Basin and discharges into the 72-inch culvert under the taxiway. This underdrain system is contaminated with high levels of organics.

The effluent from the IWTP is now sent to the Third Level (tertiary) Treatment Plant prior to discharge to Nickajack Creek and the Chattahoochee River. The three waste streams that are now treated by the IWTP are industrial waste-concentrated (IWC), industrial waste-oily (IWO), and industrial waste-general (IWG).

The IWC wastes are neutralized, clarified, and discharged into the IWG treatment stream. The IWO receives stormwater runoff from drains at outside wash racks and fueling areas. Influent to the B-10 Aeration

Figure 2.5.16
SITE G6 - B 10 AERATION BASIN AND INDUSTRIAL WASTEWATER TREATMENT FACILITY

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Basin reportedly includes bypassed stormwater runoff from the IWO system from various plant areas, treated effluent from the IWTP, and surge water and spills from the IWG system.

The B-10 Aeration Basin was apparently formed by constructing an east-west dike perpendicular to the taxiway embankment. A dike integrity study was performed by Geologic Associates for Chester Engineers and reported sound design and construction and acceptable safety factors.

The small stormwater sedimentation pond (catch basin) used for spill containment and recovery is located on the north side of the B-10 Aeration Basin (Site G6) (see Fig. 2.5-13). The basin is generally bounded by the IWTP on the northwest, an aircraft taxiway on the east, and the truck fuel farm on the south. Other structures or features in the area include a railroad spur which crosses the southern dike of the aeration basin and a sedimentation pond to the north of the aeration basin.

Surface drainage at the site is generally to the east and eventually flows through a 72-inch culvert beneath the existing taxiway.

Ground-water levels noted in the aeration basin borings in March, April, and September 1984 ranged from about 15 to 28 ft below the ground surface (corresponding to elevations of about 1,060 to 1,072 ft). Based on these data, ground-water movement in the JP-5 Fuel Spill No. 2 (Site G10) area appears to flow to the southeast. However, localized ground-water movement toward the clarifier underdrain system should be expected in the areas of the underdrain.

The water-level data indicate that the ground-water surface is [illegible] contact with the soils and sludges within the B-10 Aeration Basin [illegible] are contaminated by heavy metals ([illegible]) and several volatile organic compounds.

In addition to the B-10 Aeration Basin, a potential source of ground water contamination is the paint strip operation near the Chem Mill facility. Previous operations in the area of the IWTP included a temporary Chem Mill facility where the current Bio-Tower is located and a paint stripping operation west of the IWTP. These operations, according to J.R.B.'s Associates, had several spills onto soils in the area. These spills would flow into the stormwater sedimentation pond. If not recovered, the spilled material would enter a tributary to Big Lake.

Site G10--JP-5 Fuel Spill No. 2 (Zone 4)

The area south of the B-10 Aeration Basin (Site G6) is known as the truck fuel farm, where JP-5 Fuel Spill No. 2 occurred (see Figs. 2.5-13 and 2.5-17). Jet fuel is transported to the Lockheed-Georgia Co. by tanker truck. A rail siding is also available for rail deliveries, but is rarely used. The fuel is transferred to a pipeline and is then transported several thousand feet to a tank farm. A rupture occurred in this 8-inch pipeline during late December 1980, which resulted in the loss of approximately 24,000 gal of JP-5 fuel. At the rupture location, a 20-ft section of the fuel pipe was found to have numerous small leaks in addition to one relatively large hole. Reportedly, the pipe is buried about 5 to 7 ft below the existing ground surface at this location.

After the rupture, some of the fuel exited to the ground surface and flowed overland via the stormwater drainage system to Big Lake, approximately 2,[illegible] ft away on DAFB. Approximately [illegible] gal of fuel was recovered from the drainage ditch after the spill, [illegible] temporarily damming the stormwater system.

Law performed an investigation of the [illegible] ([illegible] Report of subsurface [illegible] contamination study [illegible] dated [illegible]). The purpose of this study was [illegible] to determine the [illegible] ground water [illegible] ground water.

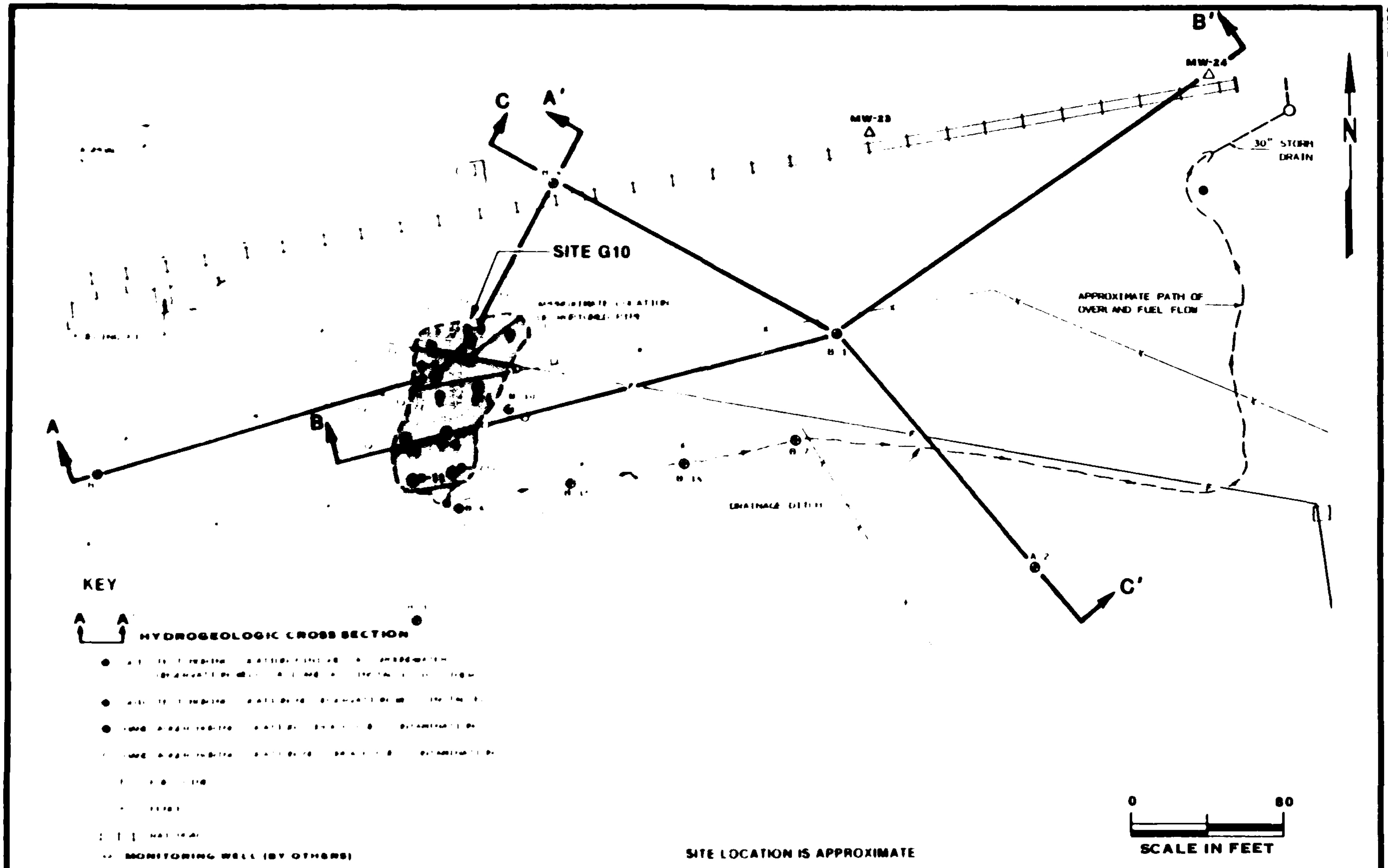

Figure 2.5-17
SITE G10—JP-5 FUEL SPILL NO. 2 BORING LOCATION PLAN

SOURCE: LAW ENGINEERING 1981

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Fifteen soil test borings and 25 relatively shallow hand-augered borings were drilled in the general spill area. Ground-water monitoring wells were installed in seven of these borings. The approximate locations of the borings are contained in Fig. 2.5-17.

Two borings (A-1 and A-2) were drilled prior to Law's work, and two other borings (MW23 and MW24) were later drilled for the B-1 Aeration Basin (Site G6) study.

The topography in the area of the initial fuel spill generally slopes from the northwest to southeast. Ground-surface elevations in this same area vary from about 1,09[illegible] to 1,08[illegible] ft, MSL. The surface cover at the site consists of both exposed soils and grass.

The following paragraphs present a generalized description of the soils encountered at the site. Figs. 2.5-15 through 2.5-2[illegible] provide interpreted hydrogeologic sections prepared from selected test borings.

Borings located in the central and northern portions of the site (B-4, B-5, and B-9) initially encountered fill soils which can be visually classified as stiff to firm, fine sandy, silty clays and loose clayey fine sands. These soils extend to depths ranging from approximately [illegible] ft at B-9 to approximately [illegible] ft at B-4. Fill encountered in the immediate vicinity of the pipe rupture (B-5) also contained zones of fine to coarse sands. Thin surface zones of fill soils consisting of silts and sands with gravel were also encountered at several borings located in the central portion of the site (B-5, B-10, B-11, B-12, and B-1[illegible]).

Residual soils were encountered at all boring locations beneath fill soils or beneath thin surface zones of topsoil. The uppermost zones of residual soils generally consisted of fine-grained soils, predominantly silt and clay. The remainder of the residual soils encountered at the

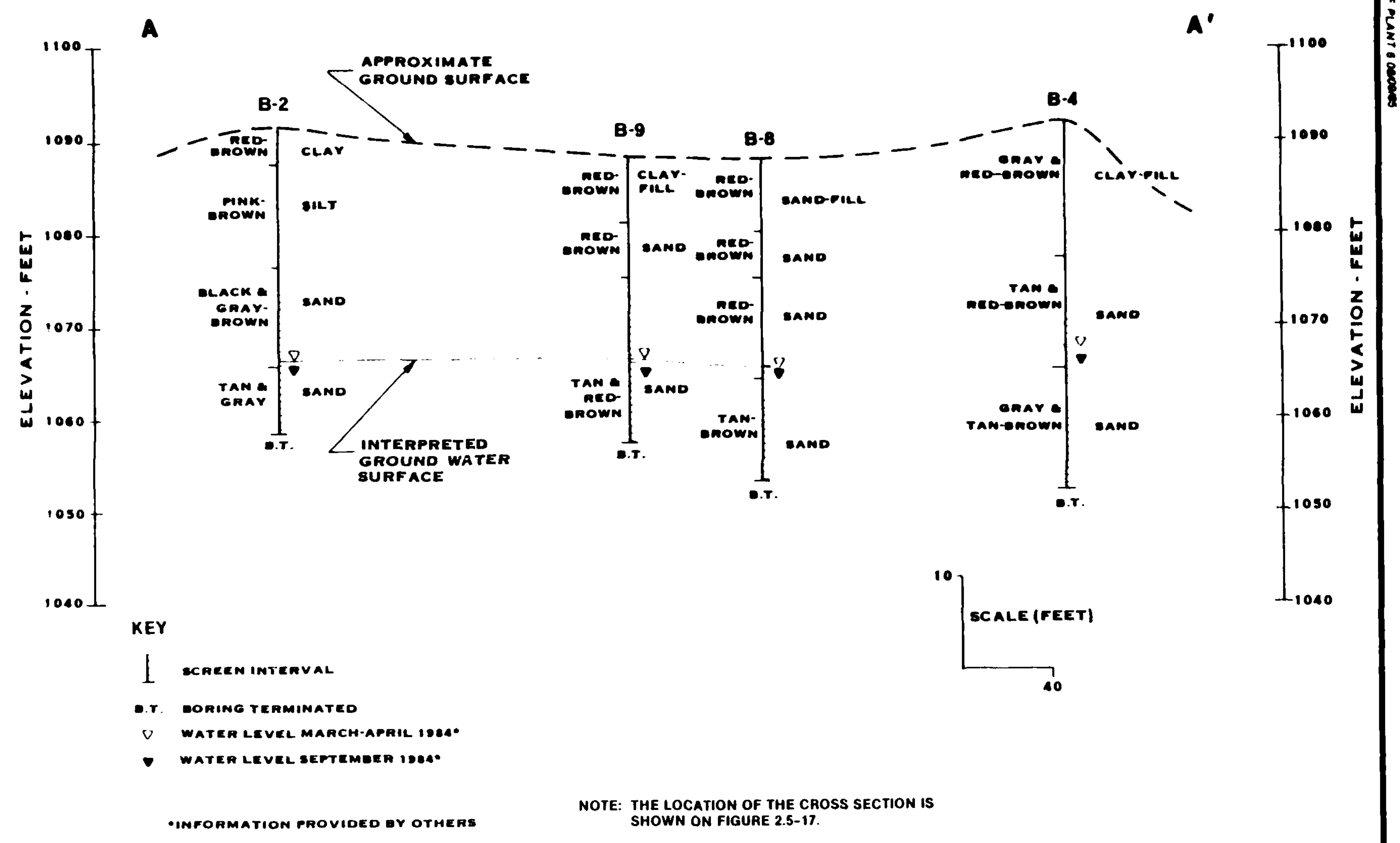

Figure 2.5-18
INTERPRETED HYDROGEOLOGIC SECTION A-A' FOR SITE G10—
JP 5 FUEL SPILL NO. 2

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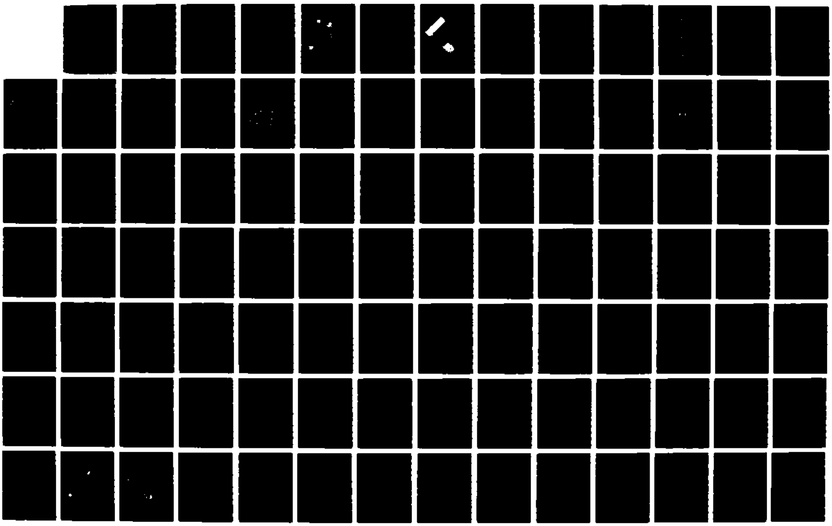

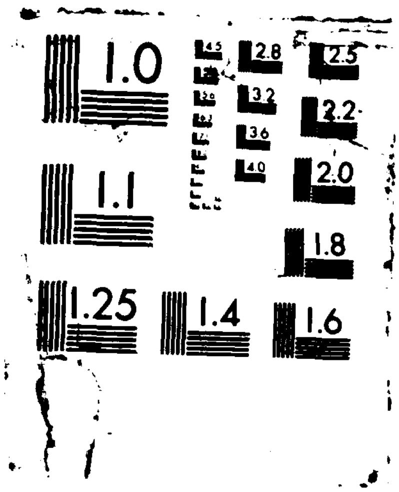
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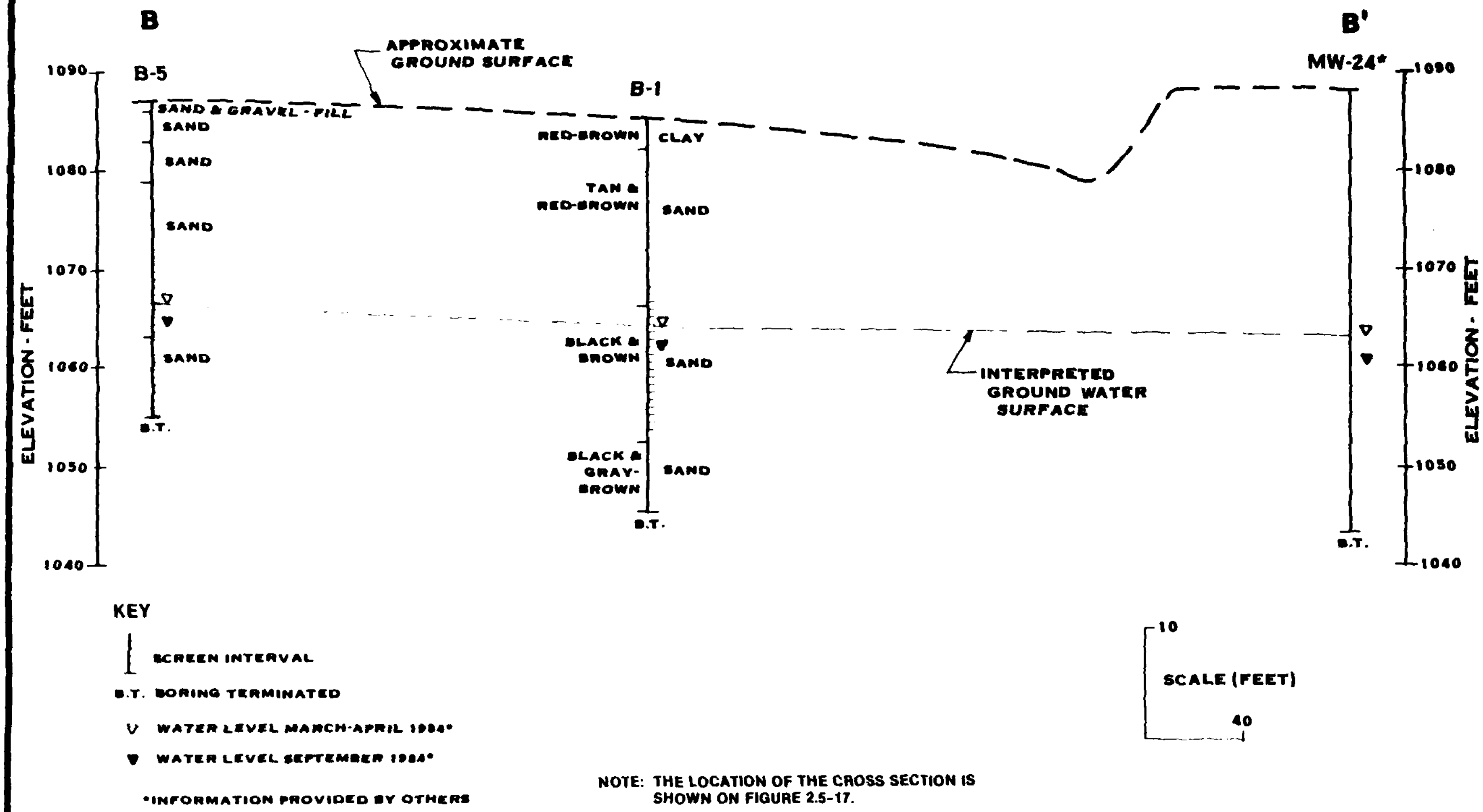

Figure 2.5-19
INTERPRETED HYDROGEOLOGIC SECTION B-B′ FOR SITE G10—
JP-5 FUEL SPILL NO. 2

SOURCE: LAW, 1985.

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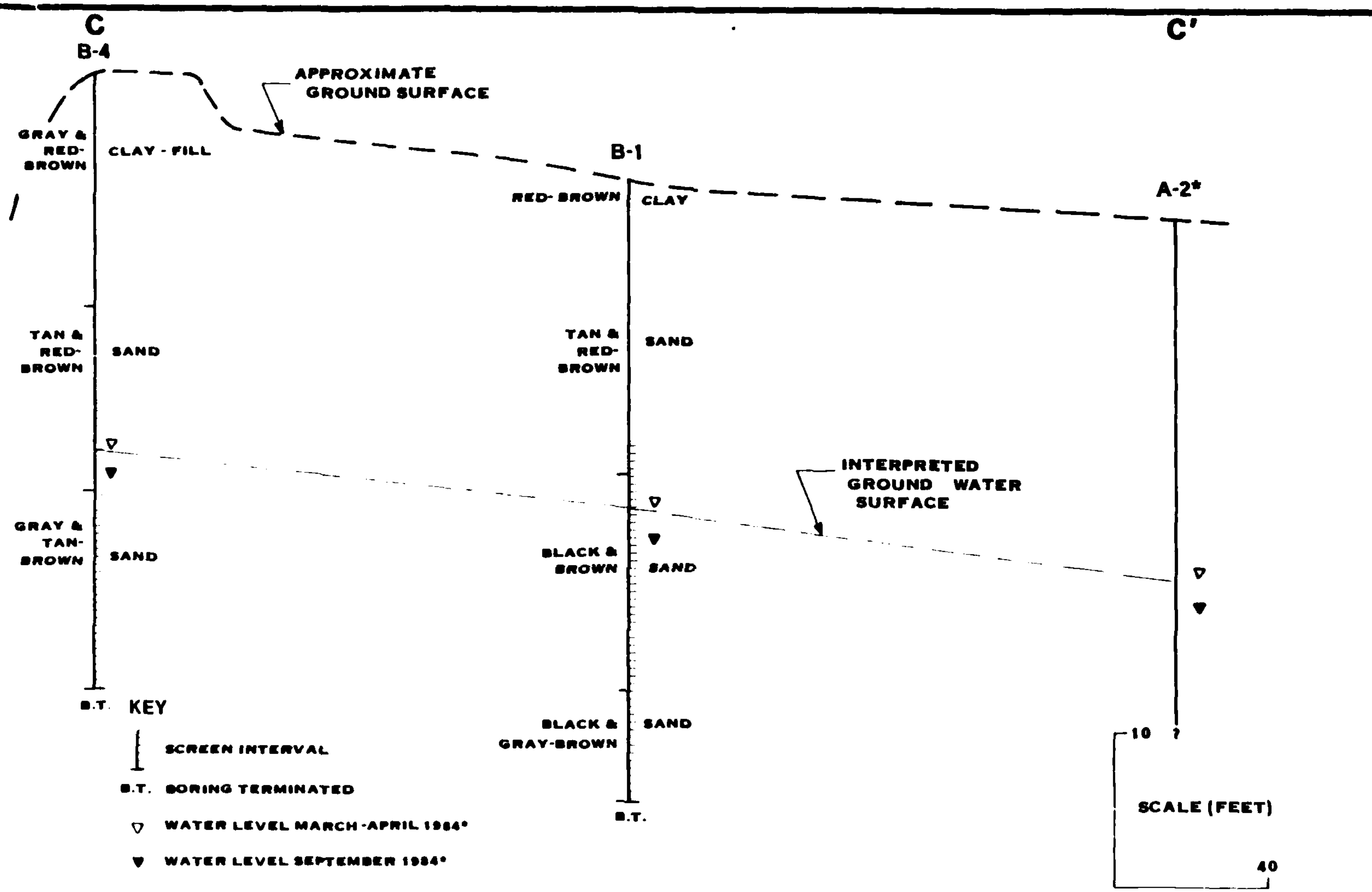

NOTE: THE LOCATION OF THE CROSS SECTION IS SHOWN ON FIGURE 2.5-17.

*INFORMATION PROVIDED BY OTHERS

Figure 2.5-20
INTERPRETED HYDROGEOLOGIC SECTION C-C' FOR SITE G10—JP-5 FUEL SPILL NO. 2

SOURCE: LAW, 1985.

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site generally can be described as firm to very dense, micaceous, silty fine to medium sands.

Material classified as partially weathered rock was encountered at several of the boring locations. This material can generally be described as very dense fine to coarse sand and is present at depths ranging from approximately 17 to 33 ft at locations B-3 and B-1 (Fig. 2.5-19), respectively. Thin zones of partially weathered rock were also encountered in B-12 and B-15 at depths near 10 ft.

Refusal material, defined as material which cannot be penetrated by soils drilling equipment, was encountered at a depth of approximately 33 ft in boring B-2. Observation Wells A-1 and A-2 (Fig. 2.5-20) were also drilled to refusal. The depth of these wells is approximately 35 ft below the existing ground surface. Refusal may result from hard cemented soils, coarse gravel or boulders, rock seams, or the top of the unweathered bedrock surface.

Ground water-level readings taken in February 1981, March and April 1984, and September 1984 at the site indicate water levels at depths ranging from about 21 to 28 ft below the ground surface. The general trend of ground-water movement at the site appears to be toward the southeast. However, it should be noted that backfill material surrounding subsurface pipelines often has a permeability considerably greater than that of the nearby natural soil This can provide a preferential pathway for migration of contaminants which may not coincide with the principal-ground-water-flow direction.

2.5.5 C-5 FLIGHTLINE ZONE (ZONE 5)

The C-5 Flightline Zone encompasses Site G11 (JP-5 Fuel Spill No. 1), Site G14 (Position 19--Fuel/Defuel Station), Site G12 (Position 71--Sodium Dichromate Spill), Site G13 (Position 58--Fuel/Defuel Station), Site G7 (Position 65--C-5 Wash Rack Ponds), and Site G16 (B-104 Gas Pump Station) (see Fig. 2.5-21).

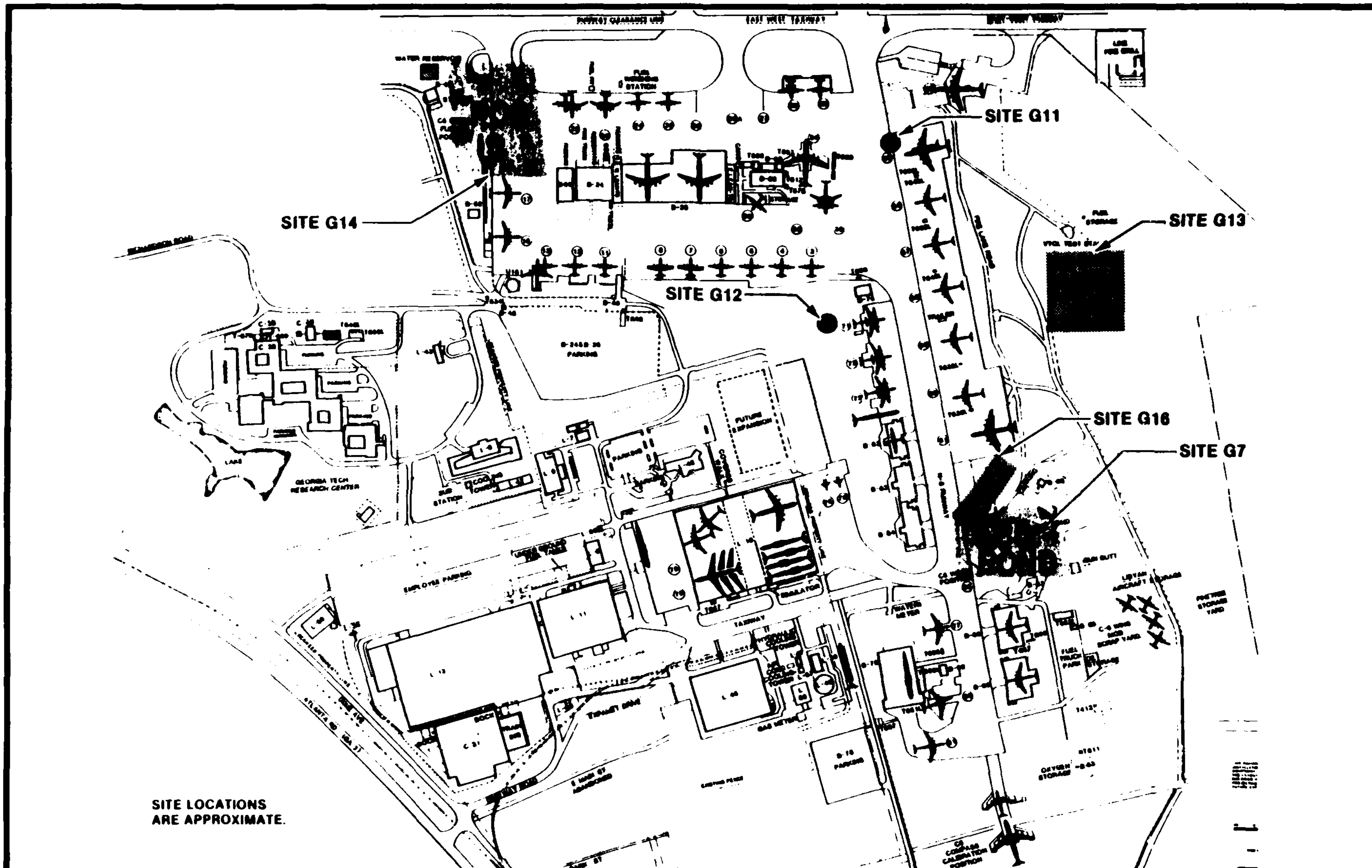

Figure 2.5-21
ZONE 5, INCLUDING C-5 FLIGHTLINE ZONE

SOURCE: THE CHESTER ENGINEERS, 1984.

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Surface drainage from this area exits Air Force Plant 6 near Position 60 via Walkers Gorge and flows via Poorhouse Creek to the Chattahoochee River. Ground-water flow tends to follow the surface drainage patterns (see Fig. 2.1-1).

The extent of impervious concrete surfaces in this area results in significant flow rates in the drainage system during rainfall events.

Site G7--Position G5--C-5 Wash Rack Ponds (Zone 5)

The Position G5--C-5 Wash Rack Ponds are immediately north of the concrete C-5 Wash Rack pad. The ponds include a topographically higher, smaller pond which discharges into a larger, lower pond (Fig. 2.5-22).

Plant water reportedly flows into the ponds from three sources: (1) wash water from the C-5 Wash Rack pad; (2) wastewater from an API oil/water separator located behind B-55 and from B-88, B-89, and T-563; and (3) water from an API oil/water separator located behind Flightline Position 61.

Previous operations at the C-5 Wash Rack have included the wash down of new C-5 aircraft, the wash down and stripping of paint from C-141 aircraft for the stretch program, and the wash down of C-5 aircraft for the Wing Modification Program. Waste products from these operations reportedly include Stoddard solvent (kerosene), tetrachloroethylene and other drycleaning solutions, Turco fabrifilm remover, paint strippers such as methylene chloride, phenolics, hydraulic fluids, and emulsion cleaner.

Recent information developed for the Position 65--C-5 Wash Rack Pond area is contained in the report by Chester Engineers (1984). Activities reported in this study include (1) chemical analysis of water samples obtained from ground-water-monitoring Wells MW14 and MW15, the two C-5 Wash Rack Ponds, the wash-rack influent to the upper pond, and the main-storm-sewer stream behind Position 61 at the DAFB fence; (2) chemical

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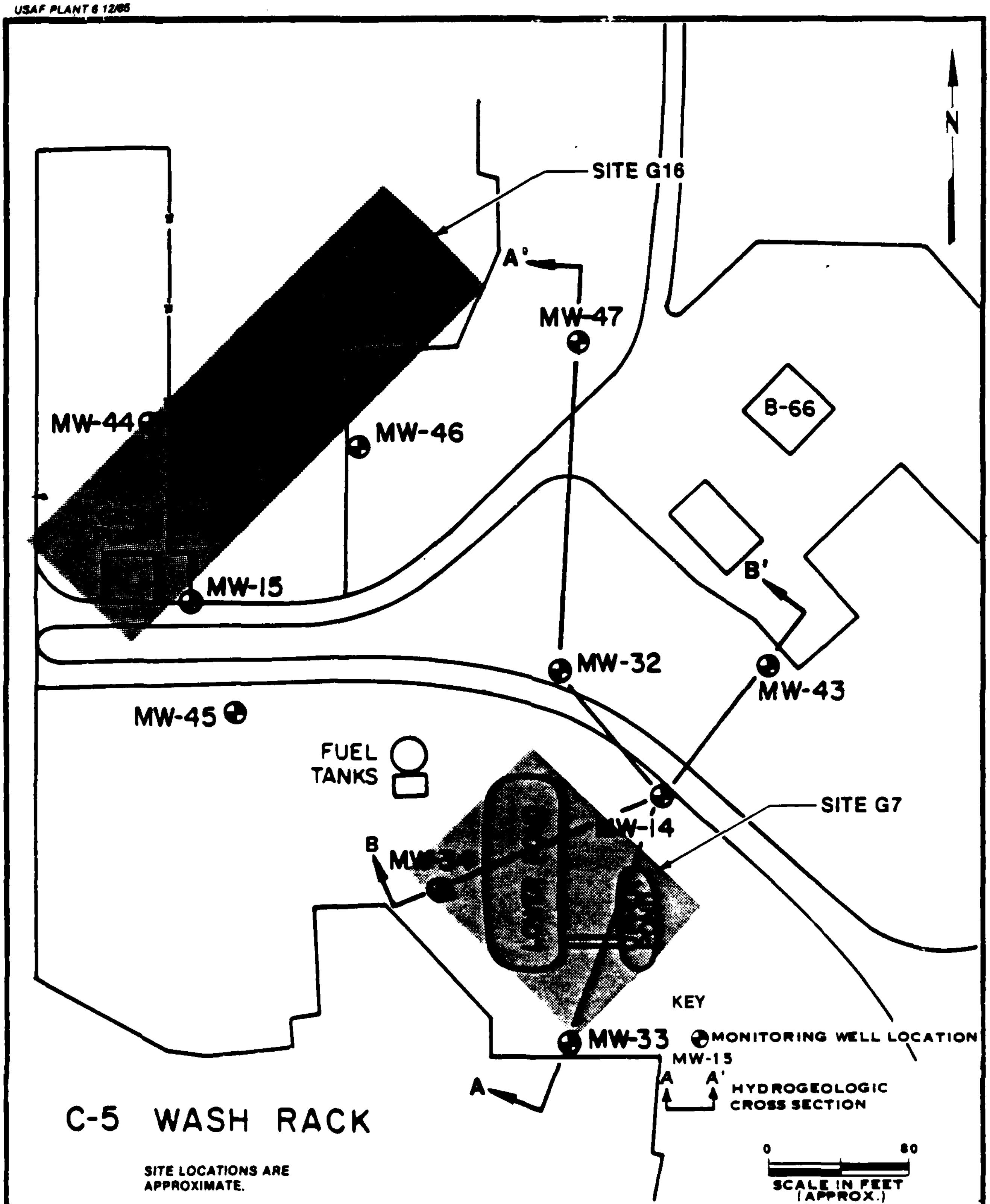

Figure 2.5-22
MONITORING WELL LOCATION PLAN FOR SITE G7—POSITION 65—C-5 WASH RACK PONDS
SOURCE: THE CHESTER ENGINEERS, 1984.

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analysis of sediment samples obtained from the upper and lower wash rack ponds; (3) installation of three ground-water-monitoring wells (MW32, MW33, and MW34); and (4) the performance of field-permeability tests--a Hvorslev slug test in MW33 and a drawdown/recovery test in MW34.

The topography in the area of the ponds slopes from about elevation 1,020 ft, MSL near the upper pond to approximately 1,010 ft, MSL near the lower pond. Surface drainage is generally from southeast to northwest in the vicinity of the ponds. The majority of the area is grassed with the exception of an asphalt paved road approximately 50 ft north of the ponds (Fig. 2.5-22). Fuel storage tanks are shown on the site plan about 50 ft northwest of the lower pond.

The water in the ponds was visibly contaminated with a floating, oily substance. A petrochemical odor was also noticeable in the area of the ponds.

The locations of monitoring wells in the Position 66--C-5 Wash Rack Ponds area are shown in Fig. 2.5-22. Interpreted hydrogeologic sections through some of the borings are contained in Figs. 2.5-23 and 2.5-24.

The most recent monitoring wells (MW32, MW33, and MW34) predominantly encountered soils described on the boring records as stiff to very stiff silts with some sand and clay. Coarse sand with a little silt was noted in MW32 below a depth of 30 ft. The soils below depths of 13 to 24 ft were noted as weathered granite. The borings were terminated at depths ranging from about 30 to 35 ft. No rock coring/boring was noted on the boring records.

Ground-water elevations reported at the monitoring wells are presented in Fig. 2.5-25. The noted ground-water levels range from about 2 to 25 ft below the existing ground surface. However, water levels in the immediate area of the ponds range from about 7 to 20 ft. The ground-water surface is located in the silty soils based on these data.

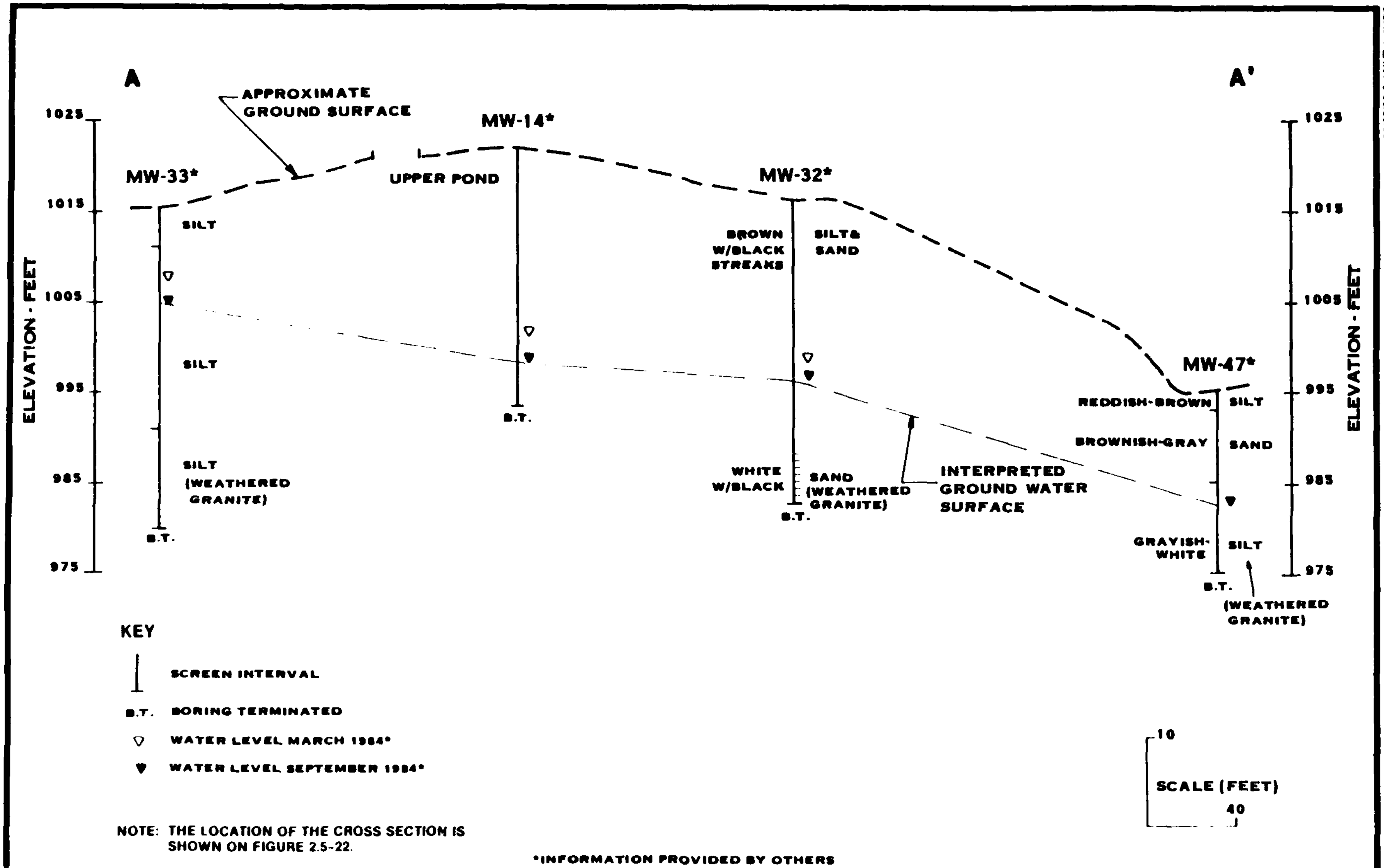

Figure 2.5-23
INTERPRETED HYDROGEOLOGIC SECTION A-A' FOR SITE G7—POSITION 65—C-5 WASH RACK PONDS

SOURCE: LAW, 1985.

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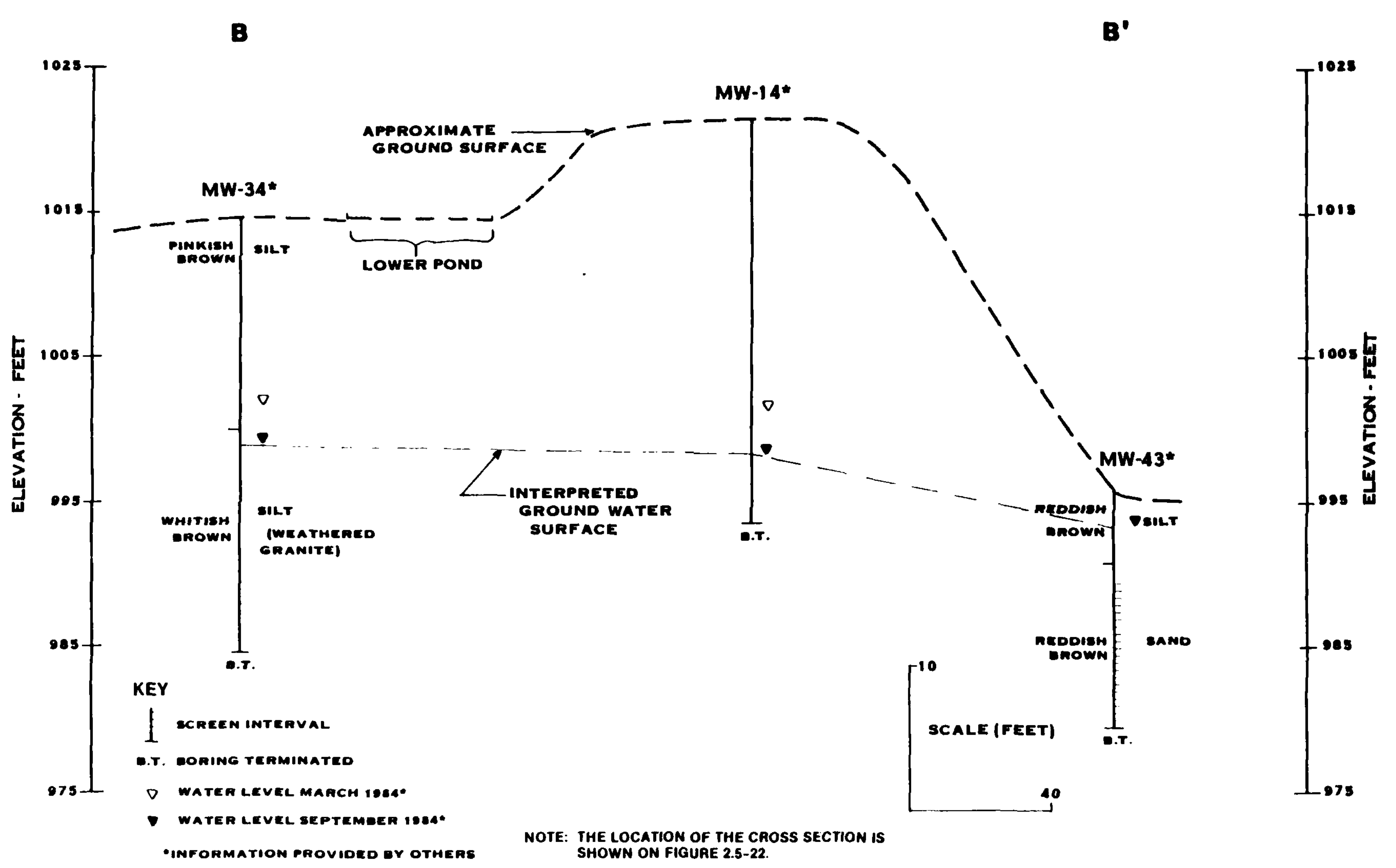

NOTE: THE LOCATION OF THE CROSS SECTION IS SHOWN ON FIGURE 2.5-22.

Figure 2.5-24
INTERPRETED HYDROGEOLOGIC SECTION B-B' FOR SITE G7—POSITION 65—C-5 WASH RACK PONDS

SOURCE: LAW, 1985.

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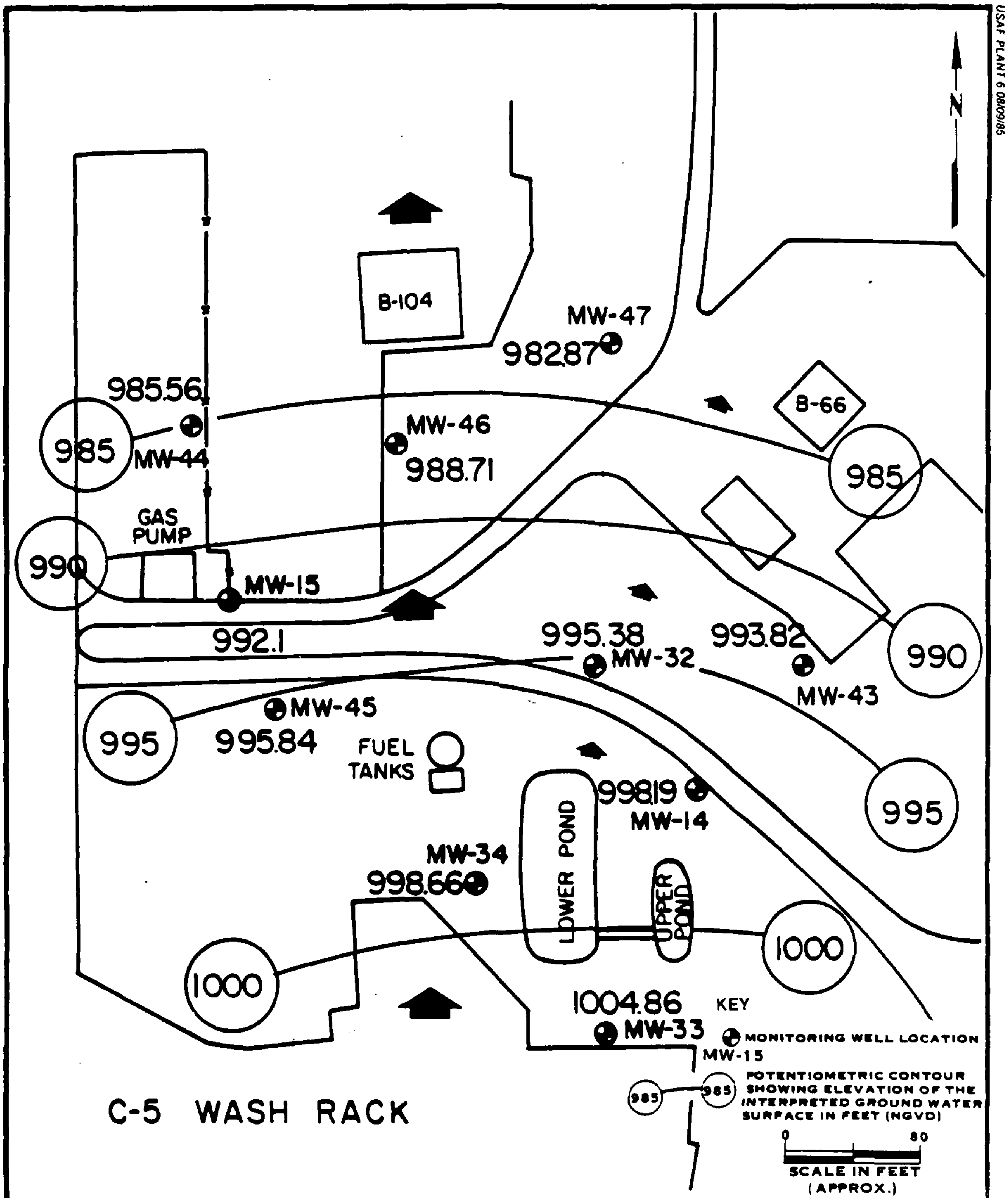

Figure 2.5-25
GROUND WATER FLOW PATTERN (SEPT. 27, 1984) FOR SITE G7—POSITION 65—C-5 WASH RACK PONDS
SOURCE: THE CHESTER ENGINEERS, 1984.

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Movement of ground water at the site appears to be primarily to the north. Interpreted-ground-water contours, prepared by the Chester Engineers, are shown in Fig. 2.5-25. The contours shown on Fig. 2.5-25 appear to be a reasonable interpretation of the ground-water surface in the area.

Site G11--JP-5 Fuel Spill No. 1 (Zone 5)

The JP-5 Fuel Spill No. 1 reportedly occurred on Sept. 28, 1984. Approximately 25,000 gal of JP-5 fuel was spilled near Position 55 on the flightline when a gasket at a fuel filter in a 6-inch line ruptured (Fig. 2.5-21). The JP-5 flowed from the flightline through a concrete storm sewer into Rottenwood Creek and into the Chattahoochee River. The creek was dammed, and the fuel and water mixture was pumped out and trucked to the IWTP. Approximately 90 percent of the spilled fuel was recovered.

The Phase I report (CH2M Hill, 1984) indicated that the JP-5 Fuel Spill No. 1 site was not considered to present significant environmental concerns. Therefore, no recommendations for further Phase II study were made as the site was no longer considered to pose a contamination threat.

Site G12--Position 71--Sodium Dichromate Spill (Zone 5)

A spill of water containing sodium dichromate reportedly occurred on Dec. 31, 1976. Three reservoirs were emptied when a water main ruptured. The L-40 reservoir contained 3.75 million gallons (MG) of water containing 20 parts per million (ppm) sodium dichromate, which is used for corrosion control in the fire protection system. Uncontaminated water was contained in a reservoir at B-52 (0.75 MG) and reservoir V-151 (0.25 MG).

The sodium dichromate spill occurred in the stormwater drainage ditch immediately south of Bldg. B-74 and west of Position 71. Water in the ditch flows southward and then proceeds east under the concrete pavement

through twin 72-inch culverts. The spill then flowed offsite through Walkers Gorge to Poorhouse Creek and then to Rottenwood Creek. Chromium concentrations immediately following the spill were 6 to 8 ppm in Rottenwood Creek. After dilution, the chromum concentration was less than 0.5 ppm in the Chattahoochee River.

ESE/Law installed four monitoring wells to depths of 20 to 50 ft. G12-2, G12-3, and G12-4 were drilled in the general area of the spill, and G12-1 was located in Walkers Gorge southeast of the spill downstream of the discharge point of the culvert beneath the flightline. The boring locations are presented in Fig. 2.5-26.

The borings in the spill area (G12-2, G12-3, and G12-4) generally encountered an upper 9 to 12 ft of silty or clay fill soils. Consistencies of the fine-grained fill materials ranged from very soft to hard, and densities of the sandier fill soils were typically loose or very loose.

Silty sands were typically present beneath the upper fill and below a depth of about 4 ft in G12-1. Relative densities of the sands generally ranged from loose to firm. The borings were terminated at depths ranging from about 20 to 35 ft. Interpreted-hydrogeologic sections are presented in Fig. 2.5-27 which represents the conditions encountered at the boring locations.

Unconfined ground water (water-table conditions) was encountered in Wells G12-1 through G12-4 at depths that ranged between about 18.0 and 7.0 ft in depth (Fig. 2.5-27). Three of the wells that have shallow-ground-water-levels are located near the stream bank where ground-water levels are near land surface.

Field-permeability tests performed at Site G12 wells yielded hydraulic conductivity values ranging from 1.7 x 10^{-4} cm/sec in Well G12-1 to 3.3 x 10^{-5} cm/sec in Well G12-2. The average k value for the three

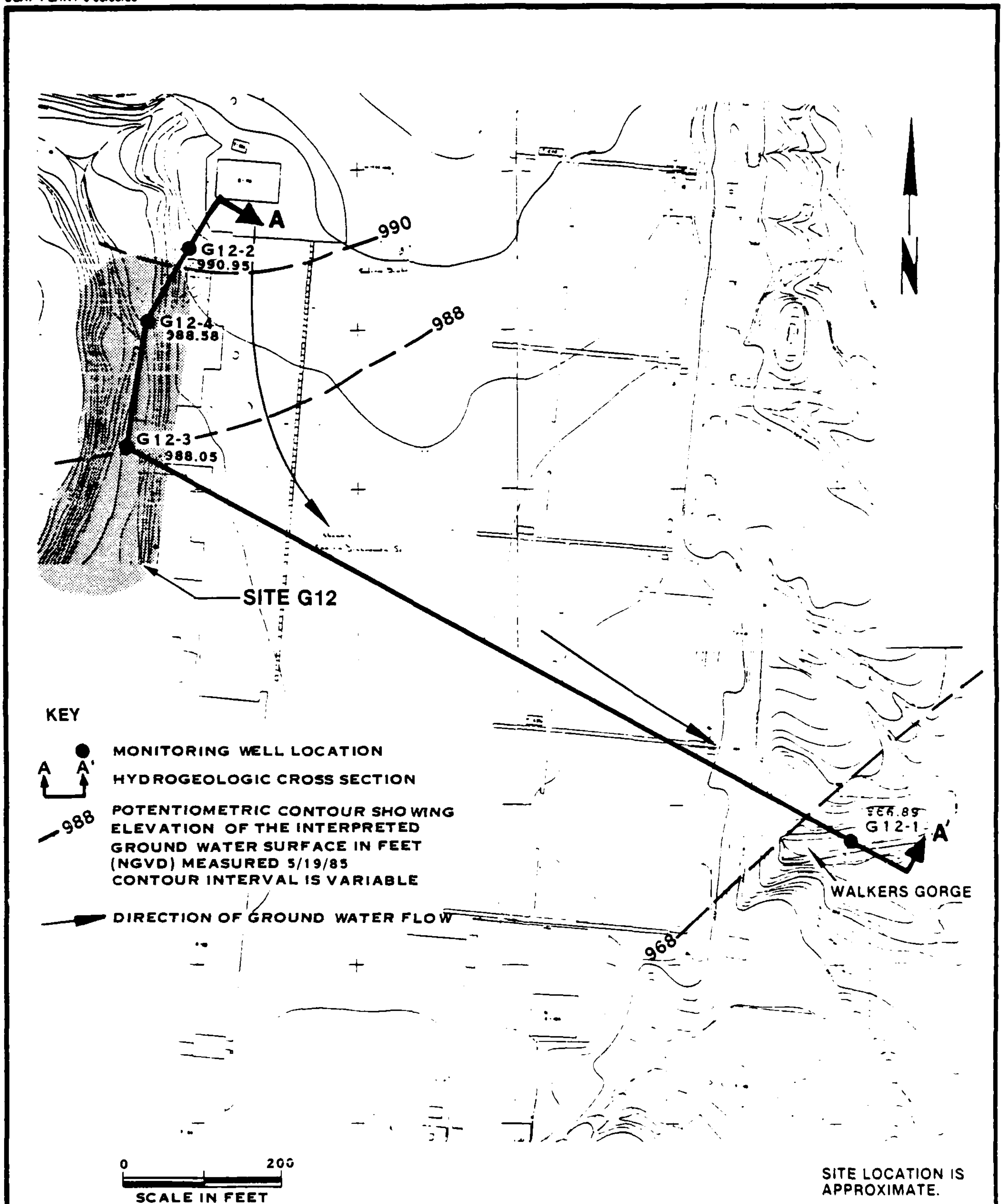

Figure 2.5-26 **MONITORING WELL LOCATION PLAN FOR SITE G12—POSITION 71—SODIUM DICHROMATE SPILL** SOURCE: LAW, 1985.	**INSTALLATION RESTORATION PROGRAM** **Air Force Plant 6**

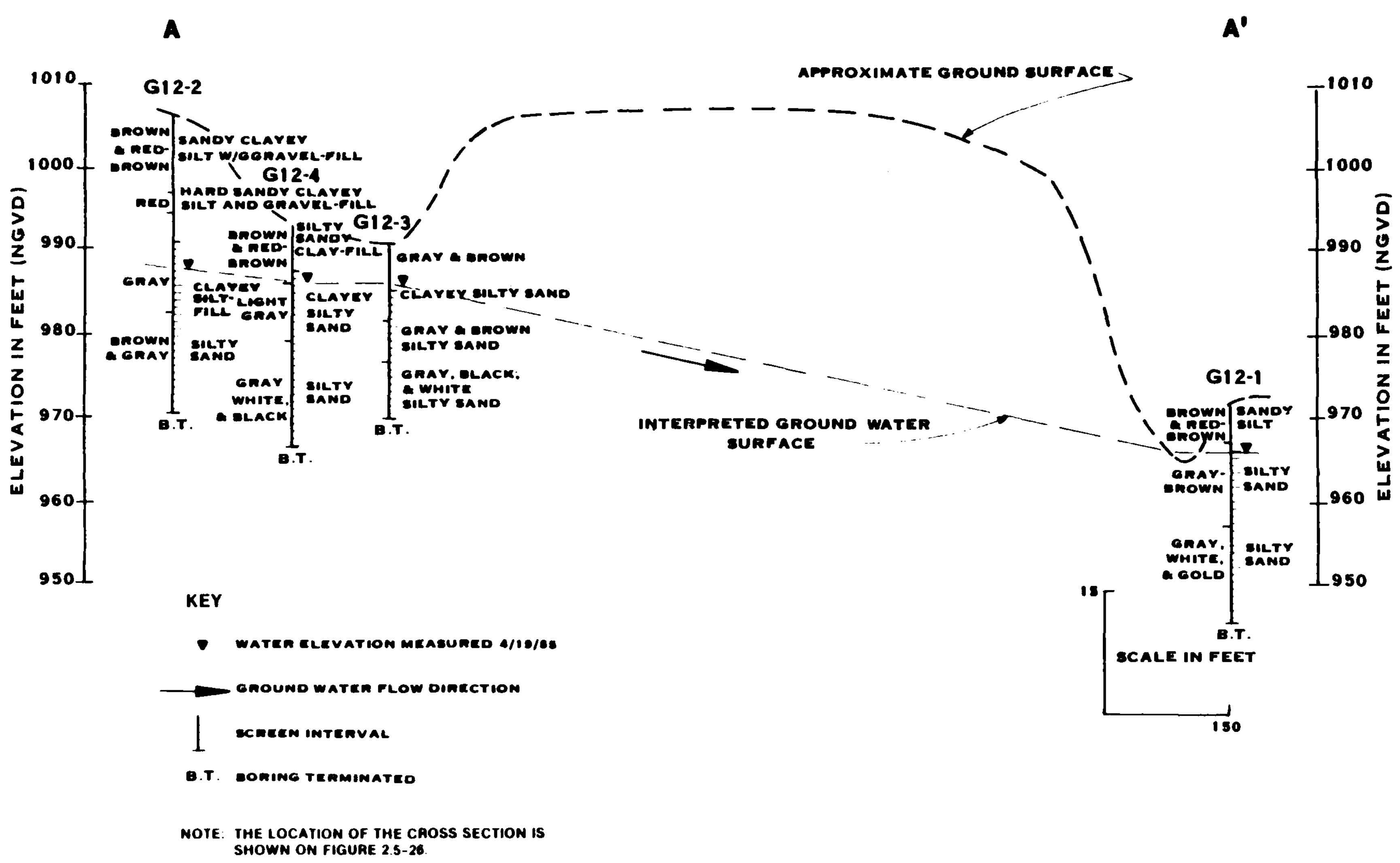

Figure 2.5-27
HYDROGEOLOGIC CROSS SECTION A-A' FOR SITE G12—POSITION 71—SODIUM DICHROMATE SPILL

SOURCE: LAW, 1985

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wells screened in the residual soils is 5.0×10^{-4} cm/sec. A laboratory permeability of 5.2×10^{-8} cm/sec for an undisturbed sample taken in boring G12-4 at 7 to 9 ft is more representative of the vertical permeability of clay fill material in the upper 10 ft of soil in that area. Vertical permeabilities in fine-grained materials are often 1 to 3 orders of magnitude smaller than horizontal permeabilities in the same material.

The direction of ground-water flow in the Site G12 area as determined by water levels in the wells is toward the southeast (Fig. 2.5-26). The hydraulic gradient determined from the potentiometric contours shown in Fig. 2.5-26 is 0.02.

The velocity of ground-water flow at the Position 71--Sodium Dichromate Spill area can be estimated with the formula $v = ki/Ne$, previously discussed in Sec. 2.5.2. Variables needed for the calculation of flow velocity include the following:

1. An average hydraulic conductivity (k) of 5.0×10^{-4} cm/sec,
2. A hydraulic gradient (i) of 0.02 between Wells G12-2 and G12-1, and
3. An assumed effective porosity of 0.20.

Given these variables, the ground-water-flow velocity at Site G12 is approximately 1×10^{-4} cm/sec (57 ft/year).

<u>Site G13--Position 58--Fuel/Defuel Station (Zone 5)</u>

The Position 58--Fuel/Defuel Station is located at the edge of the woods east of the flightline ramp area (see Fig. 2.5-21). The 30,000-gal tank is partially buried. A small stream is located 50 ft topographically downgradient from the fuel tank.

Reportedly, an oil spill occurred several years ago near an underground 30,000-gal fuel oil tank located on the north side of Position 58.

According to Lockheed-Georgia Co., most of the oil and contaminated soil was recovered (Chester Engineers, 1984).

Past investigations at MW13 (installed December 1982) do not indicate any presence of fuel contamination or chemical odor. In March 1984, 0.25 inch of fuel was discovered on the top of the water, indicating a recent seepage or spill. No evidence existed of any fuel seepage into the adjacent tributary stream. Chester Engineers installed and sampled additional monitoring wells in September 1984. Ground-water flow is shown in Fig. 2.5-28.

Site G14--Position 19--Fuel/Defuel Station (Zone 5)

Position 19--Fuel/Defuel Station, is the principal fueling/defueling station for C-5 aircraft. There are two 30,000-gal underground jet fuel storage tanks (35 ft by 12 ft by 2 inches diameter). The tanks are set on concrete cradles which in turn have a 1-ft-thick concrete foundation pad. The bottom of each tank is 17 ft below surface grade. The fuel pumping system sits in a concrete pit located on top of Tank 1.

A drainageway runs from north to south behind Position 19. The drainageway originates at a concrete storm sewer headwall which receives runoff from the main runway/taxiway system. This drainageway eventually becomes part of the stormwater drainage system exiting Air Force Plant 6 at Position 60 via Walkers Gorge.

An initial site inspection/sampling occurred in August 1984 at MW18. According to Chester Engineers, a strong chemical odor existed and 0.25-inch layer of fuel oil was visible in the well. Evidence of fuel seepage into the drainageway was also observed. The presence of organic solvents in the ground water at Position 19 was confirmed by Chester Engineers.

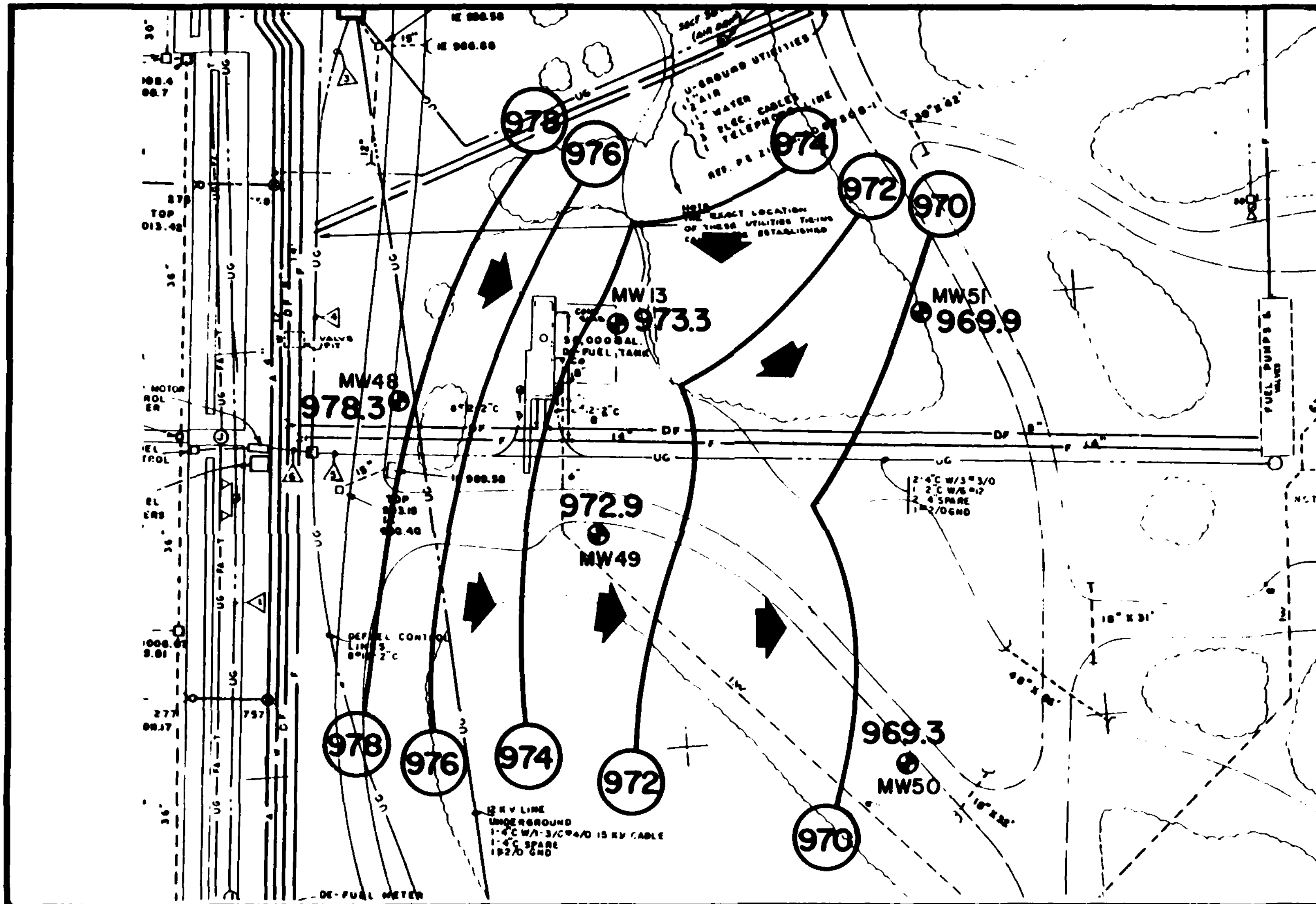

Figure 2.5-28
GROUND WATER FLOW PATTERN (SEPT. 28, 1984) FOR SITE G13—POSITION 58—FUEL/DEFUEL STATION

SOURCE: THE CHESTER ENGINEERS, 1984.

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Site G16--B-104 Gas Pump Station (Zone 5)

Another isolated contamination source in proximity to the C-5 Wash Rack is the gasoline storage tanks and pumps located between the C-5 Wash Rack and the B-104 Gas Pump Station. Two aboveground storage tanks supply jet fuel to the B-66 engine test stand. In addition, a 10,000-gal underground gasoline tank is located at the gas pump (Fig. 2.5-22).

Monitoring Well MW15 is located adjacent to the gas pump. This well was sampled as part of Chester Engineers March 1984 preliminary survey. Significant concentrations of benzene (1,500 ug/l) and toluene (1,350 ug/l) were found. Water-level information indicated that ground water flowed to the north from the C-5 Wash Rack area. Since benzene was not a significant constituent in the pond, the gasoline storage areas appeared to be potential sources of this contamination.

2.6 SUMMARY OF ENVIRONMENTAL SETTING

The environmental setting data reviewed for this investigation indicated that the following items are relevant to the assessment of past hazardous waste management practices at Air Force Plant 6.

2.6.1 GENERAL CONDITIONS

1. Surface soils and subsoils appear to be relatively impermeable; however, fractures in the occasionally near-surface bedrock may provide a means for comparatively rapid ground water flow.
2. Recharge and discharge to the shallow ground water system generally is local.

2.6.2 INDUSTRIAL WASTE LAND DISPOSAL AREA (ZONE 1)

Available data indicate that hydrologic conditions favor migration of contamination present at the three sites in this area (G1, G3, and G4) to the east toward DAFB.

2.6.3 INDUSTRIAL FACILITIES, ACTIVE LANDFILL, AND STORMWATER RETENTION BASIN NO. 2 (ZONE 2)

Available hydrologic data indicate that ground water contamination, spills, and stormwater runoff from sites in this area (Sites G2, G5, G8, and G9) will migrate to Stormwater Retention Basin No. 2 (Site G5). Water from this basin discharges offsite to the north to Rottenwood Creek. Wildwood Park and several apartment complexes are located downstream from this area.

2.6.4 B-58 WING TANK SEAL TEST FACILITY (ZONE 3)

Available hydrologic data indicate that contamination from this area (Site G15) may be migrating offsite to the north. Wildwood Park and apartments are downgradient from this area and may be potentially impacted by contaminant migration.

2.6.5 INDUSTRIAL WASTE TREATMENT FACILITY (ZONE 4)

Available data indicate that hydrologic conditions favor migration of ground water contamination in the vicinity of the B-10 Aeration Basin (Site G6) and the JP-5 Fuel Spill No. 2 (Site G10) to the east toward Big Lake on DAFB.

2.6.6 C-5 FLIGHTLINE AREA (ZONE 5)

Available hydrologic data indicate that ground water contamination, spills, and stormwater runoff from sites in this area (Sites G7, G11, G12, G13, G14, and G16) will flow offsite via the stormwater drainage system to DAFB and then into Poorhouse Creek.

3.0 FIELD PROGRAM

3.1 DEVELOPMENT OF FIELD PROGRAM

The Air Force Plant 6 Phase II, Stage 1 field program was developed based on findings and recommendations of the Phase I Records Search published by CH2M Hill in 1984, additional information obtained by site surveys, discussions with USAF and Lockheed-Georgia Co. personnel, and reports prepared by Chester Engineers, Law, and Wilson and Co. A summary of the Phase II, Stage 1 monitoring and analysis work plan is provided in Table 3.1-1. The complete scope of work outlined by USAFOEHL is provided in App. C. The quality assurance and safety plans applicable to Phase II, Stage 1 studies are found in App. D and E, respectively.

The Air Force Plant 6 Phase II, Stage 1 survey was designed primarily as a screening survey to determine the existence of contamination at the sites and the need for further monitoring. In addition to analyses for specific parameters, the survey utilizes general screening parameters such as pH, specific conductance, TOC, and TOX to detect the presence of nonspecific classes of pollutants. The parameters pH, specific conductance, TOC, and TOX are often collectively referred to as ground-water-contamination indicators. Additional sampling and analyses are recommended to determine the extent of contamination for pertinent sites where high analytical values of screening parameters may indicate potential contamination problems.

ESE's Phase II, Stage 1 investigations at Air Force Plant 6 involved monitoring-well installation and ground-water-quality monitoring and review of reports prepared by Lockheed-Georgia Co. and its contractors. This section details the field investigation methodology and program implementation at each disposal and storage site by ESE and Law.

Table 3.1-1. Summary of Phase II, Stage 1 Monitoring and Analysis at Air Force Plant 6

Site Number	Site Description	Task Description	Rationale
G2	Active Landfill	o Install 1 monitoring well o Collect 1 ground water sample	Determine horizontal extent and concentration of ground-water contamination
G5	Stormwater Retention Basin No. 2	o Install 1 monitoring well o Collect 1 ground water sample	Determine the horizontal extent and concentration of ground-water contamination
G11	JP-5 Fuel Spill No. 1	o Collect soil sample and analyze for petroleum hydrocarbons	Determine if JP-5 fuel is present in the soil
G12	Position 71—Sodium Dichromate Spill	o Install 4 monitoring wells o Collect 4 ground water samples o Collect 3 soil samples	Determine the direction of ground-water flow and extent of contamination, particularly total chromium in soil and ground water

Source: ESE, 1985.

3.2 METHODOLOGY

3.2.1 GEOPHYSICAL SURVEY TECHNIQUES

Geophysical surveys were not performed at any of the sites on Air Force Plant 6. Necessary geophysical surveys were performed in previous field investigations conducted by Wilson and Chester Engineers. ESE was directed by USAF not to duplicate unnecessary field work.

3.2.2 ORGANIC VAPOR ANALYZER (OVA) SURVEY TECHNIQUES

OVA surveys were not performed at any of the sites on Air Force Plant 6. OVA are not required for sites classified as nonhazardous. Based on previous investigations, the proposed study sites were not expected to contain organic vapors. An OVA was available at the site during well installation and core sampling but no readings were detected.

3.2.3 MONITORING WELL INSTALLATION AND SAMPLING

Six 2-inch diameter ground-water monitoring wells were installed on Air Force Plant 6. Four wells were installed at Site G12 and two near Site G5. The sample numbering system used for the monitoring wells is an alphanumeric code. The alpha character is G for Air Force Plant 6 as a GOCO facility. The first numeric character is the Site Identification Number, and the last character is the well number. Refer to Table 1.2-1 for site designations.

Borings for all ground-water monitoring wells were completed using a drilling unit equipped with a hollow-stem auger with a 4-inch inside diameter and a 6 5/8-inch outside diameter. The unit was operated without water, except when required by soil conditions. Several wells, however, had to be installed in bedrock. Rock was drilled with an NX diamond-bit core barrel until ground water was encountered. The hollow-stem auger which penetrated overburden soils was used as a temporary casing while coring. The 2-inch polyvinyl chloride (PVC) well pipe and screen were installed through the center of the hollow drill stem and positioned at the appropriate depths. Thus, the hollow-stem

augers served as centralizing devices. As the auger was withdrawn from the hole, the annular space was backfilled with suitable packing material.

Split-spoon soil sampling was performed through the total depth of the soil column in each borehole. Samples were collected every 5 ft during augering. Intact split-spoon soil samples were sectioned and stored in labeled glass jars. Each container was marked with the sample depth interval, date, and time. The split-spoon sampler was cleaned with potable water between each sample (i.e., each time a sample was removed from the tube). USAF approved sampling plans using potable water prior to beginning field work. Potable water source is from the Cobb-Marietta Water Authority and DAFB reported that the potable source has no organic contamination.

Rock cores were labeled and stored in core boxes. The core barrel was washed with potable water after each core run.

The soil samples have been retained for potential analyses in the event that ground water at those locations was found to be contaminated. If no contamination is found, soil samples will be discarded following completion of Phase II.

The total depths of monitoring wells and the locations of screened intervals are discussed for each site in Sec. 3.3. Well depths vary from 14 to 40 ft; screened intervals vary from 10 to 20 ft. The Site Geologist maintained regular contact with the Site Manager during the drilling program to make recommendations for well placement if unique geohydrologic conditions were encountered, requiring well placement or configurations different from the Work Plan.

Typical monitoring well construction in unconsolidated overburden material is shown in Fig. 3.2-1. The placement of the well in the

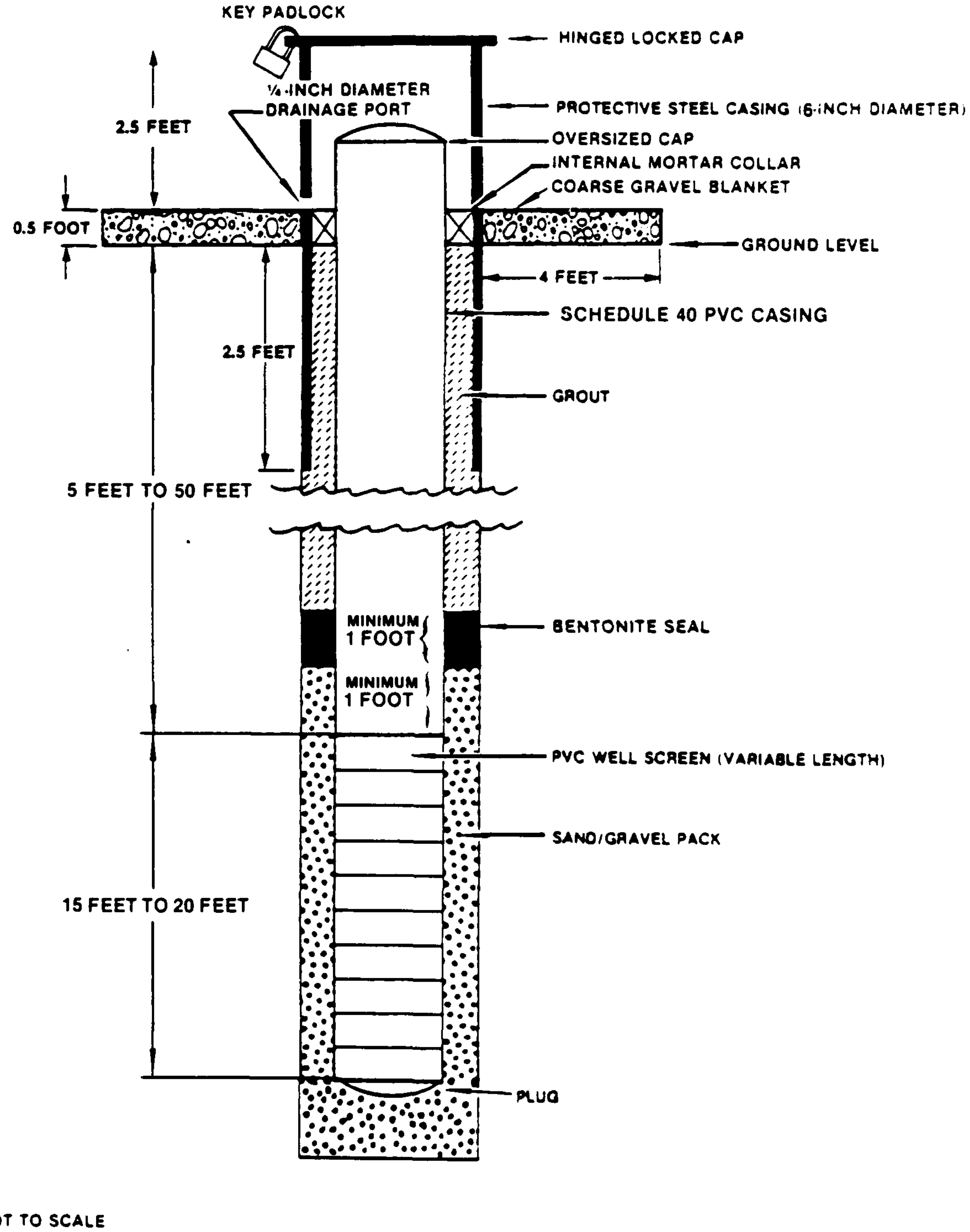

Figure 3.2-1
TYPICAL MONITORING WELL CONSTRUCTION

SOURCE: ESE, 1985.

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boring was deemed appropriate if the Site Geologist found the borehole to be sufficiently below the water table.

The monitoring wells completed in the shallow, residual soils were typically 30 ft deep. The wells were constructed of threaded, Schedule 40 PVC pipe, with a 0.010-inch slotted screen in the bottom 10- to 20-ft interval. A filter pack was placed in the annular space between the screen and the borehole. Then a bentonite clay seal was placed on the top of the filter pack, with grout in the upper annular space to the surface. The bottoms of the wells were capped before the screens were installed, and vented caps were installed at the tops of monitoring wells. Protective steel casings and locking caps were installed over the risers for security.

If the screened interval consisted of relatively clean sand, the formation was allowed to collapse around the well screen, and filter material was added above the cave-in to the appropriate depth. If not, filter material was installed around the entire length and to the top of the well screen. Potable water was added, as necessary, to assure that the bentonite pellets expanded to form a tight seal.

The bentonite-cement grout seal extended from the top of the bentonite seal to land surface. Grouting was performed in the presence of the Site Geologist. The grout was pumped into the annular space under pressure using a tremie pipe placed at the top of the bentonite seal to ensure a continuous grout seal. The aboveground protective casing was also sealed in the grout. Identifying marks were inscribed on the casing, and the casing was painted.

Coarse gravel, 0.5 ft thick and extending 4 ft radially from the protective casing, was placed on the ground surface at each monitoring well.

The following materials were used in well construction:

1. Casing used in the well was threaded PVC Schedule 40, 2-inch nominal inside diameter. The well screen was factory slotted, with a slot width of 0.010 inch. A slip-on cap was installed on each well.
2. The grout mixture was about 10 parts Portland cement to one-half part bentonite (by weight), with a maximum of 10 gal of potable water per 94-lb bag of cement.
3. Commercially available bentonite pellets manufactured specifically for well-sealing purposes were used in the seal.
4. Sand used in the filter envelope around the well screen was selected for compatibility with the screen slot size and aquifer materials.
5. A 6-inch aboveground protective steel casing was installed at each well, extending approximately 2.5 ft above land surface and seated 2.5 ft into the well seal grout. This casing was vented to the atmosphere via a lockable, hinged cap, which will prevent entry of water but is not airtight. This, and the oversized cap on the well, allow the well to remain at atmospheric pressure. A 0.25-inch-diameter drainage port was installed, centered 0.125 inch above the level of the internal monitor collar. Padlocks which open with the same key were used on all wells.

Well development was performed as soon as possible after installation. All well development data were recorded. Wells were developed by pumping with an air compressor or by bailing with a PVC bailer until the water was as clear and free of sediment as practical. Bailers were used for wells with yields that could not sustain the flow rate of the air compressor. No water was added to the wells during development. The pump or bailer was rinsed with the potable drilling water and allowed to air dry prior to use in the next well. Well development data were recorded in the field in a tabular format and included the following (see App. F for Test Boring Records):

1. Well identification;
2. Date of well installation;
3. Date of development;
4. Static water level before and 24 consecutive hours after development;
5. Quantity of water lost during drilling and fluid purging, if water was used;
6. Quantity of standing water in well and annulus (30-percent porosity assumed for calculation) prior to development;
7. Specific conductivity, temperature, and pH measurements were taken and recorded at the start, twice during, and at the conclusion of development. Calibration standards were run prior to, during, and after each day's operation in the field;
8. Depth from top of well casing to bottom of well;
9. Screen length;
10. Depth from top of well casing to top of sediment inside well, before and after development;
11. Physical character of removed water, including changes during development in clarity, color, particulates, and odor;
12. Type and size/capacity of pump and/or bailer used;
13. Height of well casing above ground surface; and
14. Quantity of water removed and time for removal.

Wells were allowed to equilibrate for at least 48 hours after installation of the protective casing and were developed until the following conditions were met:

1. The well water was clear to the unaided eye.
2. The sediment thickness remaining in the well was less than 5 percent of the screen length.
3. A volume of water was removed from the well equal to at least five well volumes (including the saturated filter material in the annulus) and a volume equal to that lost during drilling.

A 1-pint sample of the last water obtained during development at each well was obtained and stored. The cap and all internal components of the well casing above the water table were rinsed with well water to remove all traces of soil, sediment, and cuttings. This washing was conducted before and/or during development.

All water-level measurements at monitor wells were obtained using the U.S. Geological Survey (USGS) wetted-tape method, which is accurate to 0.01 ft. The tape was rinsed with water from the approved source, wiped with a fresh cloth, and allowed to air dry between consecutive water-level measurements. At least one complete set of static water-level measurements for all wells was made over a single, consecutive 10-hour period.

Each monitoring well was surveyed by a registered land surveyor to establish its map coordinates using the Georgia State Plane Coordinate System (see Table 3.2-1). The horizontal location of all test wells was established from traversing through control monuments DAFB-11 and DAFB-12. The elevations were established using specific monuments as indicated in Table 3.2-1. Elevations for points G12-1 through G12-4 were established from survey reference monument WP60B-1968 (elevation 1,004.55). Elevations for points G5-5 and G5-6 were established from U.S. Coast and Geodetic Survey Monument PBM 2 (elevation 1,007.02). Additionally, temporary control points were established during this survey and can be made available upon request.

The following procedures were used for sampling the monitoring wells:

1. The depth to water, total well depth, and length of stick-up above ground were measured.
2. During the initial sampling of each monitoring well, the depth to the water/sediment interface in the well was measured and recorded.
3. Typically, five volumes of the water in the screen, well casing, and saturated annulus were purged by pumping or bailing

Table 3.2-1. State-Plane Coordinates of Monitoring Wells

Well No.	Northing	Easting	Datum Elevation*
G12-1	1,421,294	394,642	973.34
G12-2	1,422,017	393,789	1,008.88
G12-3	1,421,760	393,739	993.45
G12-4	1,421,873	393,770	995.47
G5-5	1,430,782	390,644	1,064.32
G5-6	1,430,716	390,733	1,041.04

*Datum is top of PVC casing.

Source: Law, 1985.

before sampling. Fine-grained soils at some of the well locations caused slow recharge rates. In such cases, reduction of well purging to less than five volumes was considered if excessive time would have elapsed attempting to collect one or two samples from low-yielding wells. The amount of fluid purged was measured and recorded.

4. a. All wells were sampled using bailers constructed of inert materials (PVC). No glue was used in the construction of these bailers.
   b. A dedicated bailer was supplied for each well and remained in the well after sampling. Each bailer was etched with the number of the sampling well.
   c. The pump and the hoses used for purging were thoroughly cleaned between sampling at each well using the potable drilling water.
   d. After purging, each monitoring well was sampled as soon as sufficient water returned to minimize the contact time between the water sample and the well casing.
   e. During sampling, all equipment was placed on polyethylene sheeting to avoid contact with the soil.
5. Conductivity, pH, and temperature were measured before sampling.

The following data were recorded in a logbook for each well:

1. Well number;
2. Date;
3. Time;
4. Static water level;
5. Depth of well;
6. Number of bailer volumes removed, if applicable;
7. Pumping rate, if applicable;
8. Time of pumping, if applicable;
9. Drawdown water level;

10. *In situ* water quality measurements such as pH, specific conductance, and temperature;
11. Fractions sampled and preservatives;
12. Weather conditions and/or miscellaneous observations; and
13. Signature of sampler and date signed.

Each sample container was prelabeled for identification by laboratory personnel. The sample label included the project number, a unique sample number, time and date sampled, and sampler's initials. All samples were identified with non-water-soluble ink on ESE's standard preprinted and prenumbered labels immediately after collection. Information concerning preservation methods, sample matrix, and sample location number was included on the labels. Samples were shipped in coolers and were chilled to approximately 4°C from time of sample collection until analysis. A list of containers, preservations, and holding times is presented in Table 3.2-2; analytical parameters are presented in Table 3.2-3.

3.2.4 DRILLING LOGS AND BORING PROCEDURES

Before borings were drilled for installation of the monitoring wells, the Site Geologist reviewed the proposed drilling locations with Air Force Plant 6 Facilities Engineering personnel to avoid drilling into buried utilities such as cables or pipes. Based on this review, Facilities Engineering approved all locations and issued appropriate drilling permits. The Site Geologist supervised the drilling and installation of all borings and monitoring wells, maintained drilling logs, obtained soil samples, and observed the grouting of abandoned borings.

Drilling was performed by Law as subcontractor to ESE. In addition to drilling, Law was responsible for the following requirements:

1. Arrangement of access to all sites where drilling was proposed;

Table 3.2-2. Containers, Preservation, and Holding Times

Measurement	Container	Preservative*	Maximum Holding Times†
Waters			
Residues, Suspended, Dissolved	Polyethylene-cubitainer	Cool, 4°C	7 days
COD, TOC, Total Phenols, Kjeldahl Nitrogen, Nitrate + Nitrite, Ammonia, Total Phosphates	Polyethylene-cubitainer	Cool, 4°C, H_2SO_4 to pH <2	28 days
Oil and grease	Glass jar, Teflon®-lined cap	Cool, 4°C, H_2SO_4 to pH <2	28 days
Metals, Gross Alpha, Gross Beta, Radium, Hardness	Polyethylene-cubitainer	HNO_3 to pH <2	6 months (Mercury 28 days) (Chromium VI 24 hours)
Pesticides and PCBs	Glass jar, Teflon®-lined cap	Cool, 4°C, 0.008% $Na_2S_2O_3$**	7 days (until extraction) 40 days (after extraction)
Acid and Base/Neutral Extractables, PNAs	Glass jar, Teflon®-lined cap	Cool, 4°C, 0.008% $Na_2S_2O_3$**	7 days (until extraction) 40 days (after extraction)
Purgeable Compounds (Volatile Organics Compounds) except aromatics	Amber glass jar, Teflon®-lined septum cap	Cool, 4°C, 0.008% $Na_2S_2O_3$**	14 days
Purgeable Aromatics	Amber glass jar, Teflon®-lined septum cap	Cool, 4°C, 0.008% $Na_2S_2O_3$**	7 days (14 days if preserved with HCl to pH 2)
Total Cyanide and Amenable to Chlorination (Free Cyanide)	Polyethylene-cubitainer	Cool, 4°C, NaOH to pH >12	14 days
Chloride, Sulfate, Fluoride, Bromide, Silica, Specific Conductance	Polyethylene-cubitainer	Cool, 4°C	28 days

Table 3.2-2. Containers, Preservation, and Holding Times (Continued, Page 2 of 2)

Measurement	Container	Preservative*	Maximum Holding Times†
Alkalinity, Acidity	Polyetheylene-cubitainer	Cool, 4°C	14 days
Total and Fecal Coliform	Plastic or glass	Cool, 4°C, 0.008% $Na_2S_2O_2$	6 hours
Sulfide	Polyethylene-cubitainer	Cool, 4°C, Zinc Acetate NaOH ph > 9	28 days
Nitrite, Turbidity, BOD, Color, MBAS, Orthophosphate	Polyethylene-cubitainer	Cool, 4°C	48 hours
Soils/Sediments			
Metals, Pesticides, Acid and Base Neutral Extractables, Purgeables, Classical Inorganics	Glass jar, Teflon®-lined	Cool, 4°C	—††

*Sample preservation should be performed immediately upon sample collection. For composite samples each aliquot should be preserved at the time of collection. When use of an automatic sampler makes it impossible to preserve each aliquot, then samples may be preserved by maintaining at 4°C until compositing and sample splitting is completed.

†Samples should be anlayzed as soon as possible after collection. The times listed are the maximum times that samples may be held before analysis and still considered valid. Samples may be held for longer periods only if the laboratory has data on file to show that the specific types of samples under study are stable for the longer time. Some samples may not be stable for the maximum time period given in the table. A laboratory is obligated to hold the sample for a shorter time if knowledge exists to show this is necessary to maintain sample integrity.

**This should be used only in the presence of residual chlorine.

††EPA holding times have not been established for soils. Holding times for water samples will be used as goals for analyzing soils.

NaOH = Sodium hydroxide.
$Na_2S_2O_3$ = Sodium thiosulfate.
HNO_3 = Nitric acid.
PCB = Polychlorinated biphenyls.
COD = Chemical Oxygen Demand.
TOC = Total organic carbon.

Source: ESE, 1985.

Table 3.2-3. Analytical Detection Parameters

Analyte	Method	Detection Limit (ug/l)
Oil and Grease (IR)	EPA 413.2	100 (10 ug/g)
Total Organic Carbon (TOC)*	EPA 415.1	1,000
Total Organic Halogens (TOX)*	EPA 9020	5 (5 ug/g)
Purgeable Organics	EPA 601,602	**
pH	EPA 150.1	+0.1 unit
Specific Conductance	EPA 120.1	1 umho/cm
Primary Heavy Metals	***	
Lead	EPA 239.2	20
EP Toxicity	EPA 1310	***
Ignitability	EPA 1010	****
Copper	EPA 200.7	0.6 mg/kg
Zinc	EPA 200.7	0.5 mg/kg
Cyanide	EPA 9010	1.5 mg/kg
Phenols	EPA --	0.5 mg/kg
PCB	EPA 8080	0.1 mg/kg

*Detection limit for TOC must be three times the noise level of the instrument. Laboratory distilled water must show no response; if it shows a response, corrections of positive results must be made.

**Varies with compound. Refer to EPA method referenced above.

***

Metal	ug/l of Solution
As	10
Ba	200
Cd	10
Cr	50
Pb	20
Hg	1
Se	10
Ag	10

****Find if sample is ignitable at 140 degrees Fahrenheit or below. If so, it is a hazardous waste.

Source: USAF, 1984.

2. Steam cleaning of all drilling equipment before drilling each borehole;
3. Arrangement with Air Force Plant 6 personnel for the storage of all well-drilling equipment and well-installation supplies in a clean and secure area; clean, unused equipment and supplies were temporarily stored on sheets of disposable polyethylene at each drilling location to eliminate contamination from the native soils;
4. Obtaining potable water for drilling and well installation; portable tubs were used to hold drilling water during circulation; and
5. Recovery of all drill cuttings.

The Site Geologist maintained drilling logs in a field notebook for all boreholes. The logs comprised a record of soil characteristics, lithology, piezometer, well construction, and personnel. Each boring was logged in the field notebook as it was being drilled. The following data were recorded in the boring logs:

1. Depths, recorded in feet;
2. Soil descriptions prepared in the field by the Site Geologist in accordance with the Unified Soil Classification System;
3. Descriptions of split-spoon samples, including:
    a. Classification,
    b. Unified Soil Classification System symbol,
    c. Secondary components and estimated percentage,
    d. Color,
    e. Plasticity,
    f. Consistency (cohesive soil) or density (noncohesive soil),
    g. Moisture content, and
    h. Texture, fabric, and bedding;
4. Descriptions of cuttings, including basic classification, secondary components, and other apparent parameters;
5. Percent of secondary soil constituents, based on visual estimates;

6. Length of sample recovered in each sampled interval for split-spoon samples;
7. Blow counts, hammer weight, and length of fall for split-spoon samples;
8. Estimated interval for each sample;
9. Depth to water as first encountered during drilling and method of determination; distinct water-bearing zones (if any) below the first zone;
10. When drilling fluid was used, fluid losses, quantities lost, and the intervals over which they occurred;
11. Type of drilling equipment used, including rod size, bit type, pump type, rig manufacturer, and model number;
12. Drilling sequence;
13. Special problems;
14. Start and completion dates of all borings; and
15. Lithologic boundaries.

3.2.5 IN SITU PERMEABILITY TESTS

Field-permeability tests using the slug method were performed on all six wells to estimate the hydraulic conductivity (k) of saturated materials around the screened interval. With the slug test method, the hydraulic conductivity is determined from measuring the water-level change over time after a weighted slug [in this case, a 1.0-inch outside diameter (OD) solid PVC cylinder] is suddenly dropped into the well or removed from the well.

Field equipment used for slug testing included an IN-SITU INC. SE-1000 hydrologic monitor and pressure transducer, fiberglass measuring tape, and a PVC slug. All downhole equipment was rinsed with distilled water before testing to prevent cross-contamination between wells. Field procedures for slug tests include the following: (1) the depth to the static water level (SWL) was measured with a tape and recorded to the nearest 0.01 ft; (2) the pressure transducer was inserted into the well approximately 10 ft below SWL; (3) the depth to water was entered into

the SE-1000 hydrologic monitor as a datum or reference point for the transducer; (4) the hydrologic monitor was activated as the entire slug was submerged; and (5) when the water level approached static conditions, the slug was removed (slug out test), and the recovery rate was measured.

The value of k (hydraulic conductivity) was calculated using equation C in the NAVFAC DM-7.1 (1982) soil mechanics manual. Only slug out tests were used to derive k when the well screen was not completely saturated.

3.2.6 SURFACE SOIL SAMPLING

Before surface-soil samples were collected, the following site-specific data were recorded in the field notebook:

1. Site number, area, and location;
2. Date;
3. Time (24-hour system);
4. Antecedent weather conditions;
5. *In situ* measurements;
6. Fractions/preservatives;
7. Observations; and
8. Date and signature of sampler.

For surface-soil samples, a stainless-steel soil scoop was used to collect a representative sample. The stainless-steel soil scoop was decontaminated by washing and wiping clean betwen samples. At the conclusion of each workday onsite, the sampling team leader or designate reviewed each page of the notebook for errors and omissions before dating and signing each page.

Each sample container was prelabeled for identification by laboratory personnel. The sample label included the project number, a unique sample number, and time and date sampled with sampler's initials. All samples were identified immediately after collection with nonwater-soluble ink on ESE's standard preprinted and prenumbered

labels. Information, if appropriate, concerning preservation methods, sample matrix, and sample location number was included on the labels. Samples were shipped in coolers and chilled to approximately 4°C from the time of sample collection until analysis.

3.3 IMPLEMENTATION OF FIELD PROGRAM

Work completed at Sites G2, G5, G11, and G12 at Air Force Plant 6 is described in this section. The actual field work in this Phase II, Stage 1 part of the investigation was limited because previous field work has already been accomplished by contractors to Lockheed-Georgia Co.

On Feb. 25-27, 1985, ground water samples were obtained from monitoring Wells G5-5, G5-6, G12-1, G12-2, G12-3, and G12-4. Prior to sampling, all wells were pumped with a centrifugal pump, submersible pump, or a PVC bailer until temperature, pH, and conductivity stabilized or until a minimum of three well volumes were removed from the well casing and annulus. Prior to purging the wells, the depth to water was measured to the nearest 0.01 ft with respect to an established surveyed mark-point on top of the well casing and recorded in a field notebook.

Ground-water samples were obtained with a dedicated bailer constructed of PVC. The pump and associated hoses were thoroughly cleaned between each sampling. All sampling equipment was placed on disposable polyethylene sheeting spread on the ground to prevent soil contamination from tainting the ground-water samples.

All ground-water samples were collected in a manner which minimized aeration and prevented oxidation of reduced compounds. Each sample container and cap were thoroughly rinsed with water from the well at the time of sampling.

Ground-water samples were then chilled to 4°C, appropriately preserved, and transported to ESE's Gainesville laboratory. All ground-water

samples were split as part of ESE's specific Quality Assurance/Quality Control (QA/QC) protocols and procedures. One set of samples was analyzed by ESE, and the other set was forwarded for analysis through overnight delivery to Brooks AFB, San Antonio, Tex.

On July 22 and 23, 1985, ground-water samples were obtained again from monitor Wells G5-5, G5-6, G12-1, G12-2, and G12-3 using the same methods and QA/QC procedures as previously described.

On Feb. 26, 1985, a soil survey was conducted at the JP-5 Fuel Spill No. 1 (Site G11). A soil sample was composited from three locations (approximately 50 ft apart) at a depth of 0.5 to 1 ft.

On Feb. 26, 1985, ESE geologists also collected three sediment samples in the drainage ditch at 100-ft intervals beginning at the Position 71--Sodium Dichromate Spill (Site G12) and continuing downstream. Samples were a composite of the upper 6 inches of sediment. Samples at this site were analyzed for leachable chromium using the EP toxicity test method.

3.3.1 INDUSTRIAL FACILITIES, ACTIVE LANDFILL, AND STORMWATER RETENTION BASIN NO. 2 (ZONE 2)

The objectives of the investigation were to determine if contaminants are migrating from the area. One monitoring well (G5-5) was installed downgradient of Site G2 (Active Landfill) and Site G8 (Bldg. B-96 Complex) and another well (G5-6) upgradient of Site G5 (Stormwater Retention Basin No. 2) to evaluate the quality of the shallow ground water and to determine the horizontal extent of migration. Fig. 2.5-9 shows the location of the monitoring wells. The monitoring well depths, screened intervals, and elevations are presented in Table 3.3-1, and the hydraulic conductivity and date tested are listed in Table 3.3-2. The monitoring wells were developed as described in Sec. 3.2 of this report, with details in App. H. Test Boring Records are available in App. F. The elevations and horizontal coordinates of each well were determined

Table 3.3-1. Monitoring Well Construction Data and Water-Level Measurements

Well No.	Date Drilled	Ground Elevation (ft, NGVD)	Datum Elevation-Top of PVC (ft, NGVD)	Well Depth* (ft)	Depth of Screen Interval* (ft)	Depth of Water Level Below Datum (5/19/85) (ft)	Elevation of Water Level (5/19/85) (ft, MSL)
G5-5	02/07/85	1,061.8	1,064.32	50.5	30.5-50.5	33.37	1,030.95
G5-6	02/19/85	1,039.0	1,041.04	36.5	16.5-36.5	12.71	1,028.33
G12-1	02/04/85	971.3	973.34	24.0	4.0-24.0	6.45	966.89
G12-2	02/06/85	1,006.4	1,008.88	35.5	15.5-35.5	17.93	990.95
G12-3	02/13/85	991.0	993.45	20.5	5.5-20.5	5.40	988.05
G12-4	02/15/85	993.0	995.47	26.0	6.0-26.0	6.89	988.58

*Measured from land surface datum (LSD).

Note: All wells are 2-inch ID PVC and have a slot size of 0.010 inch.

Source: Law, 1985.

Table 3.3-2. *In Situ* Hydraulic Conductivity Values for Feb. 22, 1985

Well No.	Depth to Water from MP* (ft)	Screen Length (ft)	Saturated Screen Length (ft)	Hydraulic Conductivity (k) (cm/sec)
G12-1	6.37	20	20	1.7×10^{-4}†
G12-2	17.81	20	19.69	3.3×10^{-5}
G12-3	5.24	15	15	7.0×10^{-5}†
G12-4	7.07	20	20	7.3×10^{-5}
G5-5	34.01	20	18.49	1.2×10^{-4}
G5-6	13.08	20	20	1.4×10^{-4}†

*MP = Measuring point, top of PVC pipe.
†Hydraulic conductivity derived from taking the mean of slug in and slug out tests.

Note: Analysis and reduction of permeability data are shown in App. I.

Source: Law, 1985.

by a licensed surveyor as described in Sec. 3.2. Well G5-6 laboratory permeability tests are summarized in Table 3.3-3.

Monitoring Wells G5-5 and G5-6 were sampled according to the procedures described in Sec. 3.2.3. The samples were analyzed for the standard-ground-water-indicator parameters listed in Table 3.3-4, List A on Feb. 25-26, 1985. A second set of samples collected on July 23-24, 1985, was analyzed for the parameters in Table 3.3-4, List B. The analytical results are presented in App. K and are discussed in Sec. 4.0.

3.3.2 C-5 FLIGHTLINE ZONE (ZONE 5)

Four monitoring wells (G12-1, G12-2, G12-3, and G12-4) were installed at Site G12 (Position 71--Sodium Dichromate Spill) to evaluate the quality of the shallow ground water in the vicinity of the spill and in the drainageway behind Position 71. Fig. 2.5-26 shows locations of the wells and surface soil samples.

The monitoring well depths, screened intervals, and elevations are presented in Table 3.3-1, hydraulic conductivities in Table 3.3-2, laboratory permeability results in Table 3.3-3, and the first sampling parameters in Table 3.3-4, List A. All analytical results are presented in App. K, with Test Boring Records available in App. F, and well development data in App. H.

Monitoring Wells G12-1 through G12-4 were sampled according to procedures described in Sec. 3.2.3, and surface soil samples were collected according to procedures detailed in Sec. 3.2.6.

3.3.3 SITE G10--JP-5 FUEL SPILL NO. 2

The JP-5 Fuel Spill No. 2 occurred in the fuel off-loading area which is located south of the IWTP (Fig. 2.5-17). A pipeline ruptured during late December 1980 which resulted in a loss of approximately 24,000 gal

Table 3.3-3. Summary of Laboratory Permeability Tests

Site No.	Boring No.	Sample Interval (ft)	Initial Moisture Content (%)	Dry Unit Weight (lb/ft^3)	Permeability* (k) (cm/sec @ 20°C)
G5	G5-6	7-9	19.6	99.4	8.8×10^{-5}
G12	G12-4	7-9	20.7	107.4	5.2×10^{-8}

*Falling head permeability test of undisturbed samples using chamber pressure of 52 psi and back pressure of 45 psi.

Source: Law, 1985.

Table 3.3-4. List of Analytical Parameters for Air Force Plant 6 Field Sampling

Parameter	Units
LIST A (First Sampling of All Six Monitoring Wells)	
TOC	mg/l
TOX	ug/l
Oil and Grease	mg/l
pH	Standard units
Specific Conductivity	umhos/cm
Temperature	°C
LIST B (Second Sampling of Monitoring Wells Except G12-4)	
TOX	ug/l
EPA Method 601 Analytes	ug/l
pH	Standard units
Specific Conductivity	umhos/cm
Temperature	°C
LIST C (Site G12--Position 71--Sodium Dichromate Spill)	
Total Chromium	mg/l
pH	Standard units
Specific Conductivity	umhos/cm
Water Temperature	°C
LIST D (Site G10--JP-5 Fuel Spill No. 2)	
Moisture	%
Petroleum Hydrocarbons	ug/g
LIST E (Site G12--Position 71--Sodium Dichromate Spill)	
EP Toxicity Chromium	mg/l

Source: ESE, 1985.

of JP-5 fuel. After the rupture, some of the fuel flowed overland to Big Lake on DAFB.

The objective of this study was to determine if any petroleum hydrocarbons were present in the surface soil in the vicinity of this JP-5 Fuel Spill No. 2. Moisture and petroleum hydrocarbons were analyzed as indicated in Table 3.3-4, List D. Analytical results are presented in App. K and discussed in Sec. 4.0.

4.0 RESULTS AND SIGNIFICANT FINDINGS

4.1 RELEVANT WATER QUALITY CRITERIA AND STANDARDS

The state of Georgia does not have specific legislation enacted which specifies ground-water-quality criteria within the state. In lieu of such legislation, the state has adopted the Federal Primary and Secondary Drinking Water Standards as ground-water criteria. The National Interim Primary Drinking Water Regulations (NIPDWR) and National Secondary Drinking Water Regulations (NSDWR) were promulgated by EPA (1984). These regulations establish primary and secondary maximum contaminant levels (MCLs) for various inorganic and organic substances in drinking water. NIPDWR addresses contaminants which may adversely affect human health, whereas NSDWR addresses contaminants that affect aesthetic qualities relating to the acceptance of drinking water.

These drinking water standards established by EPA are not directly applicable to the samples collected at Air Force Plant 6 for this Phase II, Stage 1 survey. NIPDWR and NSDWR pertain to public water systems; the waters collected at Air Force Plant 6 are not used as a drinking water source either at the installation or within the immediate vicinity. However, the MCLs established by EPA regulations can be used to indicate the quality of ground water relative to drinking water. The relative MCLs established by EPA are presented in Table 4.1-1.

The list of water-quality criteria presented in Table 4.1-1 does not include all parameters that were analyzed at Air Force Plant 6. In addition to the NIPDWR and NSDWR standards, EPA in 1980 promulgated water-quality criteria for the protection of human health and aquatic life for 64 toxic pollutants or pollutant categories as named in Section 307A of the Clean Water Act.

Table 4.1-1. Relevant Maximum Contaminant Levels (MCLs) for Drinking Water*

Parameter	EPA Drinking Water Standards
	Primary Standards† (mg/l)
Arsenic	0.05
Barium	1
Cadmium	0.01
Chromium	0.05
Lead	0.05
Mercury	0.002
Nitrate	10
Selenium	0.01
Silver	0.05
Endrin	0.0002
Lindane	0.004
Methoxychlor	0.1
Toxaphene	0.005
2,4-D	0.1
2,4,5-TP	0.01
	Secondary Standards** (mg/l except for pH)
Copper	1
Iron	0.3
pH	6.5 - 8.5
Total dissolved solids	500
Zinc	5

*MCLs are given only for parameters for which analytical results are reported in the Phase II, Stage 1 study.
†EPA National Interim Primary Drinking Water Regulations.
**EPA National Secondary Drinking Water Regulations.

Source: ESE, 1985.

These 1980 EPA criteria, presented in Table 4.1-2, considered the acute and chronic adverse effects of water pollutants on aquatic organisms, non-human mammals, and humans and have been designed to protect aquatic life and humans from the effects of exposure to the various pollutants.

The human health criteria listed in Table 4.1-2 are based on the carcinogenic, toxic, or organoleptic (taste and odor) properties of the 64 toxic pollutants. For noncarcinogenic materials, the criteria have been based on the prevention of adverse human health effects in humans due to potential toxicity. In the case of suspected or known carcinogens, the criteria represent incremental increases in cancer risk to exposed populations. In assessing the human health significance of contaminants at Air Force Plant 6, the incremental risk level of 10^{-6} was chosen. This risk level is the concentration of a specific contaminant which, as projected by the EPA risk analysis, would potentially increase the incidence of cancer by no more than one additional case per one million individuals exposed over their lifetimes. The criteria listed in Table 4.1-2 are for water only; EPA has not developed any criteria for contaminants in soils or sediments.

Ground-water samples collected at Air Force Plant 6 were mostly taken from the unconsolidated deposits underlying the study sites. Ground water in this formation discharges to Poorhouse and Rottenwood Creeks, which eventually flow into the Chattahoochee River. The river is used as a potable water source for the area and is commonly used for recreation, including fishing. For these reasons, the following criteria have generally been considered the critical concentrations upon which assessment of significant contamination is based: (1) the maximum drinking water contaminant level, (2) the criterion for protection of freshwater aquatic life, or (3) the criterion for protecting human health when both aquatic organisms and water are integrated.

Table 4.1-2. Relevant Water Quality Criteria for Air Force Plant 6 Based on EPA 1976 and 1980 Criteria

Parameter (ug/l)	Freshwater Aquatic Life Criteria Acute/Chronic	Human Health (@ 10^{-6} Risk)
Bromodichloromethane	11,000/NA	0.19
Bromoform	11,000/NA	0.19
Bromomethane	11,000/NA	0.19
Carbon tetrachloride	35,200/NA	0.40
Chlorobenzene	250/50	20*
Chloroethane	NA	NA
1-2-Chloroethanevinylether	NA	NA
Chloroform	28,900/1,240	0.19
Chloromethane	11,000/NA	0.19
Dibromochloromethane	11,000/NA	NA
1,2-Dichlorobenzene	1,120/763	400†
1,3-Dichlorobenzene	1,120/763	400†
1,4-Dichlorobenzene	1,120/763	400†
Dichlorodifluoromethane	NA	NA
1,1-Dichloroethane	NA	NA
1,2-Dichloroethane	118K/20K	0.94
1,1-Dichloroethylene	11,600/NA	0.033
Trans-1,2-Dichloroethene	11,600/NA	NA
1,2-Dichloropropane	23,000/5,700	87†
Cis-1,3-Dichloropropene	23,000/5,700	87†
Trans-1,3-Dichloropropene	23,000/5,700	87†
Methylene chloride	11,000/NA	0.19
1,1,2,2-Tetrachloroethane	NA/2,400	0.17
Tetrachloroethene	5,280/840	0.8
1,1,1-Trichloroethane	NA	NA
1,1,2-Trichloroethane	NA/9,400	0.6
Trichloroethene	45,000/21,900	2.7
Trichlorofluoromethane	11,000/NA	0.19
Vinyl chloride	NA	2.0
Ethylbenzene	32,000/NA	1,400†
Toluene	17,500/NA	14,300†
Benzene	5,300/NA	0.66
2,4-D, Total	NA	160**
2,4,5-TP/Silvex-DER	NA	10**
Aldrin	3.0	7.4×10^{-5}
BHC, A	100	9.2×10^{-3}
BHC, B	100	0.0163
BHC, D	100	NA
BHC, G (Lindane)	8.0×10^{-2}	0.0186

Table 4.1-2. Relevant Water Quality Criteria for Air Force Plant 6 Based on EPA 1976 and 1980 Criteria (Continued, Page 2 of 2)

Parameter (ug/l)	Freshwater Aquatic Life Criteria Acute/Chronic	Human Health (@ 10^{-6} Risk)
Chlordane	4.3×10^{-3}	4.6×10^{-4}
DDD, pp'	1,050/NA	NA
DDE, pp'	1,050/NA	NA
DDT, pp'	1×10^{-3}	2.4×10^{-5}
Dieldrin	1.9×10^{-3}	7.1×10^{-5}
Endosulfan, A	5.6×10^{-2}	74†
Endosulfan, B	5.6×10^{-2}	74†
Endosulfan sulfate	NA	NA
Endrin	2.3×10^{-3}	1.0†
Endrin aldehyde	NA	NA
Heptachlor	3.8×10^{-3}	2.8×10^{-4}
Heptachlor epoxide	NA	NA
Toxaphene	1.3×10^{-2}	7.1×10^{-4}
PCBs	1.4×10^{-2}	7.9×10^{-4}
Arsenic, Total	440/40	2.2×10^{-3}
Barium, Total	50×10^{3}/NA	1,000
Cadmium, Total	1.5/0.012	10
Chromium, Total (mg/l)	2.2/0.04	170×10^{3}
Lead, Total	74/0.75	50
Mercury, Total	1.7×10^{-3}/ 5.7×10^{-4}	0.144
Selenium, Total	260/35	10
Silver, Total	1.2/0.12	50
Sodium, Total (mg/l)	NA	NA
Copper, Total	12/5.6	1,000*
Zinc, Total	180/47	5,000*
Cyanide (mg/l)	52/3.5	200
Phenols	10,200/2,560	300*

NA = Not available.

*Taste and odor.
†Human health criterion, EPA (1980).
**Human health criterion, EPA (1976).

Source: ESE, 1985.

4.2 ANALYTICAL RESULTS

ESE has reviewed the data and findings of the environmental reports prepared by contractors to Lockheed-Georgia Co. and the Air Force. In addition, ESE collected soil and ground water samples at four sites (G2, G5, G11, and G12). All samples were split in the field with one fraction sent to the ESE laboratory in Gainesville, Fla., and the second fraction sent to the USAFOEHL laboratory at Brooks AFB in San Antonio, Tex. Chain-of-custody data for all samples are presented in App. J. ESE raw chemical analysis data are presented in App. K. Analytical methods used and the detection limits are presented in App. L. A summary of quality assurance/quality control (QA/QC) data generated during the various chemical analyses performed for this project is presented in Tables 4.2-1 and 4.2-2 with additional information in App. L. A preliminary attempt at a comprehensive review and discussion of this extensive hydrologic and water quality data base is presented in detail in Sec. 4.3. In addition, much of the data base is presented in App. K.

4.3 GENERAL DISCUSSION

Results of the environmental data collected at Air Force Plant 6 during the Phase II, Stage 1 study are discussed in terms of relevant water quality criteria, extent of contamination, and migration potential. The water quality data will be compared to the NIPDWR MCLS plus NSDWR recommended levels and the EPA (1980) water quality criteria. Although the MCLs and EPA criteria are not directly applicable because the ground water onsite is not used for potable supply, these criteria do provide a method for estimating the relative impact on ground water quality within this area.

Previous consultants (Chester Engineers, Wilson and Co., and Law) collected many ground water samples at Air Force Plant 6 at numerous sites and analyzed them for a variety of parameters. Parameter lists were often site specific; however, most wells have results for the following EPA parameters: pH, conductivity, and TOX. Other well

Table 4.2-1. Quality Control Data Summary for Air Force Plant 6 (Sampling 1)

Parameter	Method	Units	Detection Limit	Spiked Sample	Target Value	Found Value	Percent Recovery	Replicate Sample	First Value	Second Value	Method Blank
Total Organic Carbon (TOC)	EPA 415.1	mg/l	1	480603	20.00	21.41	107.0	480101	3.27	3.19	*
Total Organic Halogens (TOX)	EPA 9030	ug/l	5	480104	2.50	2.33	93.2	480106	62.00	58.00	*
Oil and Grease	EPA 413.2	mg/l	0.1	Laboratory Pure Water	18.26	18.24	99.9	NA	NA	NA	*
Chromium, Total	EPA 200.7	mg/l	0.006	479301	0.100	0.105	104.6	479302	0.002	0.002	*
Chromium, Dissolved	EPA 200.7	ug/l	6	480400	500.00	520.00	104.0	480400	0.00	0.00	*
Petroleum Hydrocarbon	EPA 418.1	ug/g	100	Laboratory Pure Water	530.99	552.38	104.0	NA	NA	NA	*
Moisture (Percent Wet Weight)		%	—	NA	NA	NA	NA	480500	22.00	21.00	*
pH	EPA 150.1	Standard units	—	NA	NA	NA	NA	NA	NA	NA	NA
Specific Conductance	EPA 120.1	umho/cm	1	NA	NA	NA	NA	NA	NA	NA	NA

NA = Not applicable.
* = Below detection limit.

Source: ESE, 1985.

Table 4.2-2. Quality Control Data for TOX and Pesticides (Sampling 2)

Parameter	Method	Units	Detection Limit	Spiked Sample	Target Value	Found Value	Percent Recovery	Replicate Sample	First Value	Second Value	Method Blank
Total Organic Halogens (TOX)	EPA 9020	ug/l	5	539300	249.99	230.00	92.0	539301	240.00	230.00	*
Bromodichloromethane	EPA 601	ug/l	1	NA	NA	NA	NA	539304	1.0000	1.0000	*
Bromoform	EPA 601	ug/l	1	NA	NA	NA	NA	539304	1.0000	1.0000	*
Carbon Tetrachloride	EPA 601	ug/l	1	laboratory pure water	4.998	4.640	92.8	539304	1.0000	1.0000	*
Chloroform	EPA 601	ug/l	1	laboratory pure water	4.998	4.140	82.8	539304	146.000	143.000	*
Dibromochloromethane	EPA 601	ug/l	1	laboratory pure water	4.998	4.500	90.0	539304	1.000	1.000	*
1,2-Dichlorobenzene	EPA 601	ug/l	1	NA	NA	NA	NA	539304	1.000	1.000	*
1,3-Dichlorobenzene	EPA 601	ug/l	1	NA	NA	NA	NA	539304	1.000	1.000	*
1,4-Dichlorobenzene	EPA 601	ug/l	1	NA	NA	NA	NA	539304	1.000	1.000	*
Dichlorocifluoromethane	EPA 601	ug/l	1	NA	NA	NA	NA	539304	1.000	1.000	*
1,1-Dichloroethane	EPA 601	ug/l	1	laboratory pure water	4.998	4.270	85.4	539304	2.570	2.830	*
1,1-Dichloroethylene	EPA 601	ug/l	1	laboratory pure water	4.998	4.320	86.4	539304	18.500	18.200	*
Trans-1,2-Dichloroethene	EPA 601	ug/l	1	laboratory pure water	4.998	4.070	81.4	539304	1470.00	1470.00	*
1,2-Dichloropropane	EPA 601	ug/l	1	laboratory pure water	4.998	4.500	90.0	539304	1.000	1.000	*
Cis-1,3-Dichloropropene	EPA 601	ug/l	1	NA	NA	NA	NA	539304	1.000	1.000	*
Trans-1,3-Dichloropropene	EPA 601	ug/l	1	NA	NA	NA	NA	539304	1.000	1.000	*
Methylene Chloride	EPA 601	ug/l	2	laboratory pure water	4.998	4.760	95.2	539304	2.000	2.000	*
1,1,2,2-Tetrachloroethane	EPA 601	ug/l	1	laboratory pure water	4.998	5.220	104.5	539304	1.000	1.000	*
Tetrachloroethene	EPA 601	ug/l	1	NA	NA	NA	NA	539304	14.8	14.6	*
1,1,1-Trichloroethane	EPA 601	ug/l	1	laboratory pure water	4.998	4.210	84.2	539304	13.3	13.7	*

Table 4.2-2. Quality Control Data for TOX and Pesticides (Sampling 2) (Continued, Page 2 of 2)

Parameter	Method	Units	Detection Limit	Spiked Sample	Target Value	Found Value	Percent Recovery	Replicate Sample	First Value	Second Value	Method Blank
1,1,2-Trichloroethane	EPA 601	ug/l	1	laboratory pure water	4.998	4.500	90.0	539304	1.000	1.000	*
Trichloroethene	EPA 601	ug/l	1	laboratory pure water	4.998	5.050	101.1	539304	37700.00	37700.00	*
Trichlorofluoromethane	EPA 601	ug/l	1	NA	NA	NA	NA	539304	26.100	26.900	*
Vinyl Chloride	EPA 601	ug/l	1	NA	NA	NA	NA	539304	1.000	1.000	*
Chlorobenzene	EPA 601	ug/l	1	NA	NA	NA	NA	539304	1.000	1.000	*
Chloroethane	EPA 601	ug/l	1	laboratory pure water	4.998	4.660	93.2	539304	1.000	1.000	*
2-Chloroethylvinylether	EPA 601	ug/l	1	laboratory pure water	4.998	4.510	90.2	539304	1.000	1.000	*

*Below detection limit.
NA = Not analyzed.

Source: ESE, 1985.

samples were analzyed for the additional parameters of oil and grease, TOC, volatile organics, heavy metals, and specific organics.

No criteria or standards exist for direct evaluation of TOX data. As a requirement of RCRA ground water compliance monitoring, extensive background data are required to determine statistically whether monitoring well contaminant levels are significantly higher than background levels.

Similar to results found at DAFB monitoring wells, TOX was detected in all monitoring wells, including the background monitoring wells. These TOX data indicate the possibility of a positive matrix interference in the analysis. If present, this positive interference may be due to the presence of inorganic halides (e.g., chlorides) in the water. Inorganic chlorides were not analyzed for, but are commonly found in ground water within this region and especially from ground water emanating from landfilled areas and surface impoundments. Previous documentation of positive matrix analysis has been determined by Dressman (1984). Documentation of the magnitude of these interferences is not currently available in the literature.

4.3.1 INDUSTRIAL WASTE LAND DISPOSAL (ZONE 1)

Site G1--Surface Impoundment, Site G3--Past Landfill, Site G4--Sanitary WWTP Sludge Disposal Area

A summary of significant chemical data collected from May to July 1984 is presented in Tables 4.3-1 and 4.3-2. The entire data set for the chemical analyses is presented in Wilson and Co.'s "Groundwater Quality Assessment Report, Surface Impoundment" of Oct. 10, 1984. Ground water monitoring wells at this site are BR-1 through BR-3, B-1 through B-7, D-1 through D7, and E-1 through E-8. All available data were not presented. Only those wells that provided significant data were summarized.

Data from Wilson and Co. collected in May and June 1984 document that most of the shallow and bedrock wells within this area are contaminated

Table 4.3-1. Chemical Analysis Summary Table for Site G1—Surface Impoundment

Sample Date	Monitoring Well No.	Lead (mg/l)	pH	TOX (ug/l)	Conductivity (umhos/cm)	TOC (mg/l)	TVOC (ug/l)	1,1-Dichloroethane (ug/l)	1,2-Trans-Dichloroethylene (ug/l)	1,1,1-Trichloroethane (ug/l)	TCE (ug/l)	Vinyl Chloride (ug/l)	Chlorobenzene (ug/l)	1,1-Dichloroethylene (ug/l)	Methylene Chloride (ug/l)	1,2-Dichloropropane (ug/l)
07/20/84	BR-1	0.0005	6.4	10	106	ND	9.5	ND	ND	ND	9.5	ND	ND	ND	ND	ND
07/20/84	BR-2	0.055	5.9	1,600	1,220	11.0	2,402	280	730	760	760	13	ND	280	30	ND
08/16/84	BR-3	ND	7.8	—	264	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
05/30/84	B-1	—	4.5	—	75	ND	812	ND	1,400	680	6.8	7.9	ND	1.0	ND	ND
05/31/84	B-2	ND	6.3	1,400	1,818	41	5,681.6	1,300	1,400	2,100	65	140	6.6	670	ND	ND
05/31/84	B-3	ND	5.3	1,700	1,380	25	5,681.6	54	1,200	87	180	100	ND	30	ND	ND
05/30/84	B-5	0.056	4.8	200	30	ND	541	ND	ND	ND	5.6	ND	ND	35	ND	ND
05/29/84	D-1	0.083	5.6	ND	60	ND	3,937	ND	35	ND	2,400	7.8	ND	ND	35	ND
05/29/84	D-2	ND	5.5	87	67	ND	3,937	ND	33	ND	ND	7.8	ND	ND	35	1,300
05/29/84	D-3	ND	5.1	250	43	ND	106	ND	30	ND	76	ND	ND	ND	ND	ND
06/01/84	D-4	ND	5.0	610	79	ND	681	ND	22	ND	1,100	ND	ND	ND	45	200
07/20/84	E-1	ND	5.6	ND	62	ND	786.5	ND	ND	640	6.5	ND	ND	170	ND	ND
07/20/84	E-5	ND	6.0	-	163	ND	902	ND	730	ND	110	8.0	37	ND	11	ND
07/28/84	E-7	ND	5.1	ND	118	ND	1,206.2	ND	160	5.2	710	ND	ND	ND	ND	150
07/28/84	E-8	ND	5.7	ND	433	ND	1,996	130	1,200	320	200	13	ND	130	6.1	15
06/13/84	DH-36 (Pump 6)	ND	7.4	20	1,170	ND	36.4	ND	15	ND	ND	9.0	ND	5.8	6.6	ND

Note: All volatile compounds have not been reported.

TVOC Total Volatile Organic Carbon.
ND Nondetectable.

Source: Wilson and Co., 1984.

Table 4.3-2. Chemical Analysis Summary for Borings B-2, B-3, B-4, and B-5

Parameter	Ground Water Sample Location B-2	B-3	B-4	B-5*
Endrin (mg/l)	<0.00003	<0.00003	<0.00003	<0.00003
Lindane (mg/l)	<0.000008	0.00008	<0.000008	<0.000008
Methoxychlor (mg/l)	<0.0003	<0.0003	<0.0003	<0.0003
Toxaphene (mg/l)	<0.0012	<0.0012	<0.0012	<0.0012
2,4-D (mg/l)	<0.0052	<0.0052	<0.0052	<0.0052
2,4,5-TP, Silvex (mg/l)	<0.0001	<0.0001	<0.0001	<0.0001
Turbidity (NTU)	3,100	1,000	1,700	1,800
Total Coliform (colonies per 100 ml)	<100 NI	<100 NI	<100 NI	1,700 NI

Additional Information:
B-5 Trace of DDT
0.18 ppb 2,4,5-T (2 columns)
B-2 0.93 ppb methyl parathion (2 columns)
numerous organophosphates
No PCBs found in samples.

*Background monitoring well.

Source: Law Engineering and Testing Company, 1981.

with volatile organics such as vinyl chloride, 1,1-dichloropropane, TCE, and other compounds indicated in Table 4.3-1. Water supply Well U134 (Well 6) is also contaminated with volatile organics. This well is approximately 200 to 300 ft deep. Construction details are not known. Water supply Wells U113 (Well 5) and U131 (Well 4) were not contaminated.

The extent of contamination suggests that Site G1 (Surface Impoundment), Site G3 (Past Landfill), and Site G4 (Sanitary WWTP Sludge Disposal Area) are sources of much of the contamination. However, the data also suggest additional sources of contamination are present. Wilson and Co. personnel state that uncontrolled spillage of organics at Bldg. B-90 may be one source. A second source may be fill suspected to have been placed along the west bank of the unnamed stream. This reach of the stream has been observed to contain three rusty drums and construction debris (Wilson, 1984).

Ground-water flow patterns suggest that slightly elevated concentrations of sodium and chloride are not from the Surface Impoundment (Site G1) but may be from the septic tank leach field east of Bldg. B-90 (see Fig. 4.3-1).

Lead concentrations are elevated in Well D-1 (0.083 mg/l) and exceed the safe water drinking limit of 0.05 mg/l. Well BR-2 is completed in bedrock from 29 to 79 ft. Data indicate this ground water is contaminated with organics and inorganics typical of compounds from the Surface Impoundment plume. Contamination does not extend to BR-3, which is completed in bedrock from 180 to 229 ft.

The distribution of inorganic and organic compounds across the site is complex. The data demonstrate that the distribution of organic compounds does not follow the same distribution patterns as the inorganic compounds. Wilson and Co. attempted to identify organic sources of contamination based on the distribution of phenols and

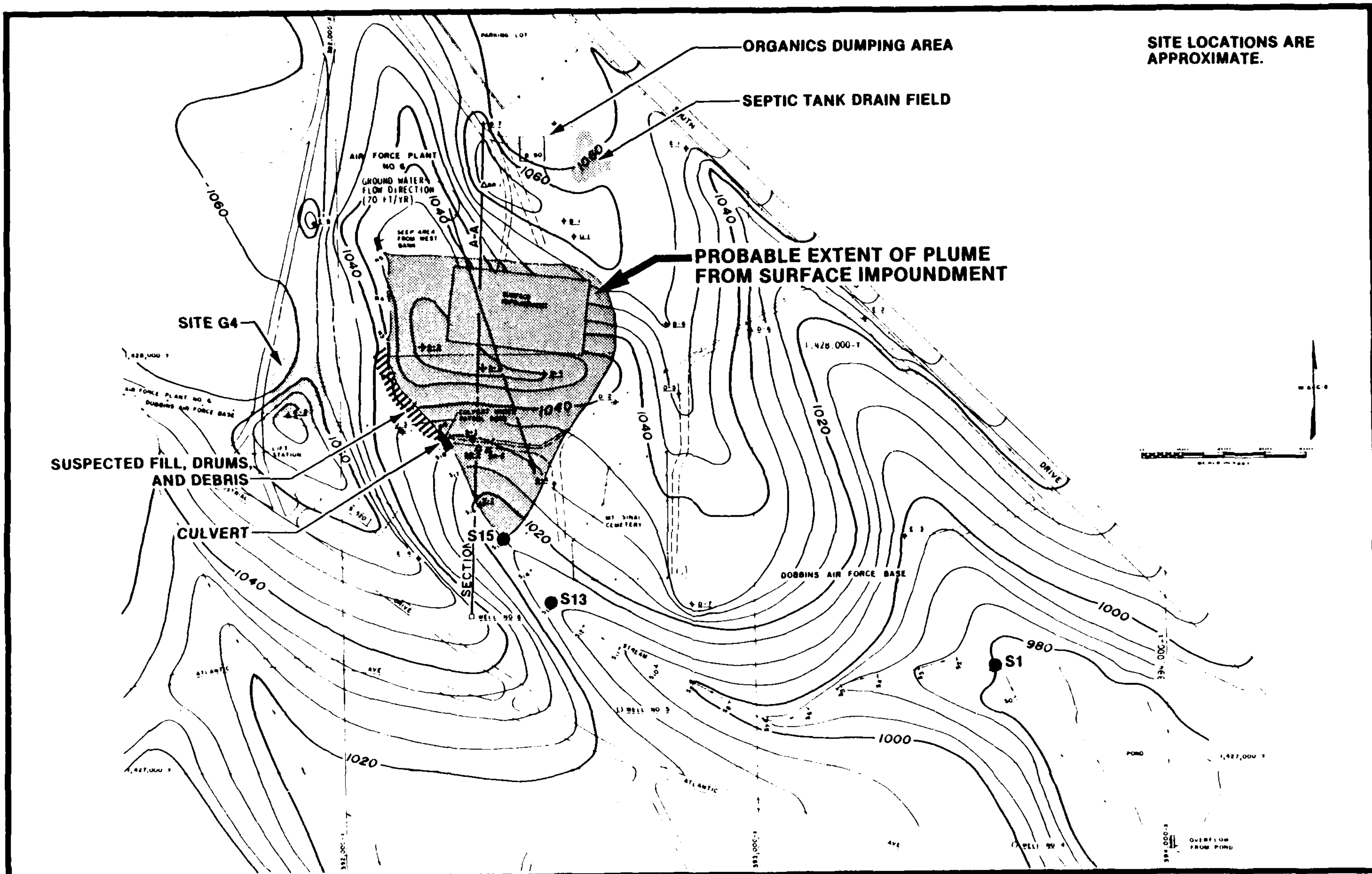

Figure 4.3-1
PLUME EXTENT AT SITE G1—SURFACE IMPOUNDMENT

SOURCE: WILSON & CO., 1984.

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volatile priority pollutants. Twelve separate volatile compounds were detected near the Surface Impoundment (Site G1). Distribution plots for the six volatile compounds detected at the highest concentrations have been developed by Wilson and Co. in their Oct. 10, 1984 report. Refer to App. O for a summary by Wilson and Co. of the distribution of six priority pollutants detected: 1,1-dichloroethane, 1,1-dichloroethylene, 1,1-trichloroethane, 1,2-dichloropropane, trichloroethylene, and trans-1,2-dichloroethylene.

Table 4.3-1 summarizes the data for well locations where specific organic compounds were detected. The occurrence and distribution of these compounds across the site indicate that sources of organics contaminants cannot be conclusively identified with the existing data.

The actual extent of both inorganic and organic contamination from the Surface Impoundment is not known. Although Wilson and Co. depicts the plume as shown in Fig. 4.3-1, this area is surrounded on the northeast, east, and south by contaminated wells. The sources of this contamination are not known. Suspected sources could be Bldg. B-90 (Radome Building) to the northeast or the old septic leach field to the east. Although previous EP toxicity tests indicate that the sludge in the Sanitary WWTP Sludge Disposal Area is not a hazardous waste, concentrations of chromium and lead in the sludge are sufficiently high to warrant further monitoring. Contamination from the Past Landfill (Site G3), which encompasses the Surface Impoundment, could be superimposed on all of these sources.

The contaminant plume from these sites intersects the stream to the south as shown in Fig. 4.3-1. The estimated rate of flow varies between 17 and 90 ft per year. The documented extent of the ground water plume is approximately 600 ft south of the Surface Impoundment. Migrating contaminants include heavy metals, organic priority pollutants, and common salts.

Data gathered from the bedrock wells, particularly BR-2, indicate contaminants have entered the bedrock beneath the area. The bedrock ground-water flow is not well understood.

Water quality data collected on May 31, 1985, for three stations in the unnamed stream are presented in Table 4.3-3. The culvert station is located where the stream leaves Air Force Plant 6 and enters DAFB. Station S-13 is located approximately 400 ft downstream, and Station S-1 is located upstream of the confluence with the outfall from Little Lake on DAFB. Wilson and Co. (1984) states that "Data suggest constituents contributed to the stream by the impoundment are either diluted, as in the case of inorganics, or removed, as in the case of volatile priority pollutants, prior to the stream leaving the study area. Data indicate the stream water leaving the site is free from harmful concentrations of any constituents and would be considered a safe drinking water supply by any standard." Additional analyses to confirm water quality standards leaving offsite should be collected on a regular basis.

Law (1981) reported analyses detecting pesticides in the Surface Impoundment. A trace of DDT, 2,4,5-T (0.18 ppb), and methyl parathion (0.93 ppb) were identified by gas chromatograph scan. Law suggested that one possible contamination source was the solvent store on the concrete apron area located north of Bldg. B-90.

4.3.2 INDUSTRIAL FACILITIES, ACTIVE LANDFILL, AND STORMWATER RETENTION BASIN NO. 2 (ZONE 2)

This area encompasses the following sites located within the drainage area defined on Fig. 2.5-9:

1. Site G9 (TCE Spill at B-76),
2. Site G8 (Bldg. B-96 Complex),
3. Site G5 (Stormwater Retention Basin No. 2), and
4. Site G2 (Active Landfill).

Site G9--TCE Spill at B-76

The TCE Spill at B-76 occurred on Mar. 27, 1983, in the chemical storage yard east of Bldg. B-73 while transferring 10,000 gal of TCE to the aboveground storage tank. The underground pipeline failed, and, while under pressure, TCE was subsequently pumped to the lower soil stratum under the pavement. The TCE then surfaced by cracking through the asphalt and flowed overland for about 50 ft to a storm drain inlet.

Table 4.3-3. Water Quality Data for Unnamed Stream*

Parameter	Station Culvert	S-13	S-1
Volatile Organics (ug/l):			
1,1-dichloroethane	12	4.8	ND
1,2-trans-dichloroethylene	31	18	ND
1,1,1-trichloroethane	27	17	ND
1,1-dichloroethylene	7.2	5.5	ND
TCE	16	26	ND
1,2-dichloropropane	ND	11	ND
Base/Neutrals:			
Di-n-Butylphthalate	ND	9.0	ND
Acid Compounds	ND	ND	ND

*Samples collected on May 31, 1984.

Source: Wilson and Co., 1984.

According to best inventory estimates, 1,066 gal of TCE was lost to the environment, half to the Stormwater Retention Basin No. 2 (Site G5) and the remainder in the soil/ground water under the asphalt.

The TCE Spill at B-76 (Site G9) is a chemical staging area in an asphalt-paved yard with a 12,000- to 14,000-gal TCE storage tank and an area for storage of other hazardous materials. The site is highly impervious.

The B-99 TCE Transfer Station is located along the railroad west of Bldg. B-99 and adjacent to Bldg. B-76. Fuel drippage from locomotives is visible. No surface residual of TCE is present based on surface soil samples by Chester Engineers.

The water-table surface is in contact with residual soil overburden throughout the area. The dominant surface-water and ground-water flow direction follows the axis of the stream valley in a northerly direction. According to Chester Engineers, there is no indication of any ground-water transport out of the closed-valley system. As a result, it is believed that all contaminated ground water and surface water exit the system through or under the Stormwater Retention Basin No. 2 (Site G5).

Chester Engineers' preliminary investigation of the TCE Spill at B-76 (Site G9) resulted in the installation of six additional monitoring Wells (MW26, MW27, MW28, MW29, MW30, and MW31). Georgia EPD now considers the TCE Spill at B-76 in the industrial facility area to be a RCRA-regulated hazardous waste disposal unit.

Water quality samples were collected at various times from the six monitoring wells located throughout the area affected by the TCE Spill at B-76. Table 4.3-4 lists and identifies the applicable monitoring wells in this area. Tables 4.3-5 and 4.3-6 present a history of the TCE contamination at various points in the vicinity of the spill area. The

Table 4.3-4. Monitoring Well Identification Summary for TCE Spill at Sites G2, G5, G8, and G9

Monitoring Well	Location
MW1	Bldg. B-30
MW2	South of Bldg. B-3 (upgradient)
MW5	Bldg. B-65
MW6	Bldg. B-8
MW26	Bldg. B-76 (TCE Storage Tank)
MW27	Bldg. B-30
MW28	Bldg. T-56D
MW29	Stormwater Retention Basin No. 2 (Site G5)
MW30	Stormwater Retention Basin No. 2 (Site G5)
MW31	Active Landfill (Site G2)
G5-5 (ESE)	Active Landfill (Site G2)
G5-6 (ESE)	Stormwater Retention Basin No. 2 (Site G5)

Sources: Chester Engineers, 1984.
ESE, 1985.

Table 4.3-5. Summary of TCE Contamination (ug/l) at the TCE Spill Area and Stormwater Retention Basin No. 2

Date Sampled	Monitoring Wells		Stormwater Retention Basin No. 2 (Site G5)	
	MW5	MW6	Influent	Effluent
04/20/83			792.0	509.0
04/22/83			581.0	17.6
04/28/83	1,140.0		430.0	16.2
05/03/83	26.5	26.5		
05/09/83	771.0	10,000.0	203.0	<1.9
05/17/83	1,035.0	2,100.0		4.5
05/20/83	7,622.0	6,960.0		
05/25/83	3,190.0	156,000.0	1,040.0	<1.9
06/01/83		10,300.0	226.0	1.9
06/14/83	2,045.0	5,195.0	109.0	1.9
07/15/83	705.0	7,720.0	215.0	11.1
08/05/83	606.0	4,120.0	245.0	16.3
09/12/83	132.0	5,810.0	876.0	20.6
10/11/83	95.0	6,230.0	181.0	22.8
11/07/83	81.6	6,910.0	480.0	43.9
11/14/83			366.0	24.0
01/27/84	1,020.0	3,980.0	634.0	27.2
02/24/84			27,000.0	3,580.0
02/28/84			520.0	35.3
03/02/84	1,450.0	2,770.0	558.0	39.0
05/15/84	441.0	1,100.0	217.0	

Note: Blank indicates no data available.

Source: Chester Engineers, 1984.

Table 4.3-6. TCE Spill Area Monitoring Wells Data (includes undated data)

Monitoring Well	Date	TCE (ug/l)	Benzene (ug/l)	Ethyl Benzene (ug/l)	Toluene (ug/l)	pH	Specific Conductance (umho/cm)	1,2-Dichloroethane (ug/l)	Methylene Chloride (ug/l)
MW1	05/19/83	—	—	—	—	5.8	128	—	—
	?	<10	<10	—	<10	—	—	<10	<10
MW5	05/19/83	—	—	—	—	5.8	165	—	—
	06/14/83	2,045	—	—	—	—	—	—	—
	?	441.0	295.0	—	400.0	—	—	75	<10
MW6	05/03/83	26.5	10.7	—	13.1	—	—	—	—
	05/19/83	—	—	—	—	6.3	160	—	—
	06/14/83	5,195.0	8.5	42.5	12.6	—	—	—	—
	?	1,100.0	<10	—	<10	—	—	183	<10
MW26	05/19/83	—	—	—	—	5.5	250	—	—
	?	335,638.0	<10	—	70.0	—	—	2,200	52
MW27	05/19/83	—	—	—	—	6.4	260	—	—
	?	11,400.0	5,650.0	—	1,200.0	—	—	<10	<10
MW28	05/19/83	—	—	—	—	6.1	134	—	—
	?	950.0	<10	—	<10	—	—	<10	650
MW29	05/19/83	—	—	—	—	5.9	84	—	—
	?	540.0	<10	—	<10	—	—	51	120
MW30	05/19/83	—	—	—	—	6.1	70	—	—
	?	<10	<10	—	<10	—	—	<10	<10
MW31	05/19/83	—	—	—	—	5.2	38	—	—
	?	<10	<10	—	<10	—	—	<10	53

Note: Dashes indicate no data available.
Question mark indicates sampling date unknown.

Source: Chester Engineers, 1984.

data, which are compiled from a Chester Engineers report, show that the shallow ground water in the entire drainage area of Stormwater Retention Basin No. 2 is contaminated by a variety of volatile organics, including TCE, 1,2-dichloroethane, benzene, toluene, and methylene chloride. Chester Engineers has concluded that other undocumented sources of organic contamination exist in the area. ESE concurs with this conclusion. For example, MW27 had detectable levels of benzene (5,650 ug/l) and toluene (1,200 ug/l) in addition to TCE. These compounds are indications of another contamination source, most likely a gasoline/jet fuel spill. The presence of benzene (100 ug/l) and toluene (1 ug/l) in MW5 adds support to the existence of other contaminant sources in the downgradient area. Significant TCE contamination (>300 mg/l) is limited to the immediate area of the spill, and the plume follows the major axis of ground water flow down the valley. A broad zone of lesser contamination extends beneath the Active Landfill (Site G2). Contaminated infiltration into the storm sewer is a long-term problem.

The Bldg. B-96 Complex (Site G8) includes surface runoff from the southeast side of the Bldg. B-96 Complex. The IRP Phase I study revealed suspected disposal of sealants, paints, and solvents in this region. The area to the southeast is currently a solvent drum storage and reclaim center. Surface soil samples indicate minor organic contamination of methylene chloride (62 ug/g) and 1,1,1-trichloroethane (14 ug/g). Minor spillage has occurred, and minor organic contamination is present in a very localized area. Surface drainage from the Bldg. B-96 Complex discharges to Stormwater Retention Basin No. 2 (Site G5).

Previous reports (CH2M Hill and Chester Engineers) have stated that the Bldg. B-96 Complex (Site G8) is not believed to be a potential contaminant source. However, data from the July 22, 1985 sampling by ESE indicate severe contamination in a new Well G5-5 located downgradient of Site G8. These data show 38,000 ug/l of TCE, 1,500 ug/l of trans-1,2-dichloroethylene and 3,000 ug/l of TOX in Well G5-5. The

contamination could be residuals from the TCE spill at Site G9 (TCE Spill at B-76) or could have resulted from historical spills in the Bldg. B-96 Complex or the empty drum storage and recycling area.

Site G2--Active Landfill

The Active Landfill (Site G2) primarily receives demolition debris, laboratory waste, construction materials, and possibly small quantities of waste engine oils, paints, fuels, and solvents. The main storm sewer which carried the TCE spill passes beneath the landfill. Surface runoff from the landfill contained only volatile TCE (17 ug/l), which suggests the Active Landfill does not contain significant organic contributions. ESE/Law field teams installed and sampled monitoring Wells G5-5 and G5-6 (see Tables 4.3-7 and 4.3-8) for results.

The Active Landfill may be a source of either organic or inorganic contamination. Runoff quality around the Active Landfill indicated no significant contamination. However, MW G5-5 had a moderately high value of TOX (5,800 ug/l) (Table 4.3-7). Additional analysis of EPA Method 601 halocarbons conducted by ESE is presented in Tables 4.3-7 and 4.3-8. Chester Engineers data indicated that the TCE spill plume extends under this landfill site. This may have been confirmed by the presence of volatile organics in GW5-5 and GW5-6 in the July 1985 sampling.

According to Chester Engineers, other currently unknown sources of organic contamination are present, including historic and current maintenance operations and chemical storage areas. Suspected sites are as follows:

1. Old B-8 vehicle maintenance operation,
2. B-30 and B-65 maintenance yards, and
3. Possible old chemical storage sheds upgradient from MW28.

Table 4.3-7. Summary of Ground Water Analyses from the Industrial Facility Area*

Parameter	Units	Well Identification G5-5	Well Identification G5-6
pH	standard units	4.8	4.8
Specific Conductivity	umhos/cm	65.0	171.0
TOX	ug/l	3,000	150
Chloroform	ug/l	150	<1.0
Trans-1,2-dichloro-ethylene	ug/l	1,500	210
Trichloroethylene	ug/l	38,000	85
Remaining EPA Method 601 Analytes†	ug/l	<30	<30

*Sampling was conducted on July 22-23, 1985.
†The complete list of analytical data is found in App. L.

Source: ESE, 1985.

Table 4.3-8. Summary of Analytical Data for Sites G2 and G5*

Ground Water Parameters	Units	Site G2--Active Landfill (Well G5-5)	Site G5--Stormwater Retention Basin No. 2 (Well G5-6)
Oil and grease	mg/l	2	<0.7
TOC	mg/l	3.0	3.2
TOX	ug/l	5,800	530
pH	Standard units	4.3	4.9
Specific conductivity	umhos/cm	33.0	9.9

*Sampling was conducted on Feb. 25-27, 1985.

Source: ESE, 1985.

Site G5--Stormwater Retention Basin No. 2

Stormwater Retention Basin No. 2 (Site G5) is adjacent to South Cobb Dr. and discharges into Rottenwood Creek. Volatile organic priority pollutants have been identified in the retention basin influent sediments and effluents as summarized in Table 4.3-9.

The Bldg. B-58 storm sewer system from Site G15 (B-58 Wing Tank Seal Test Facility) enters Stormwater Retention Basin No. 2 (Site G5) on the southeast side. This storm sewer may be another source of TCE. However, at the time of sampling, no volatile priority pollutants were detected.

Sediments had minor organic contamination, but this is not a significant problem or a hazardous waste consideration. MW G5-6 had TOX levels of 530 ug/l near this site. EPA Method 601 halocarbon analytes analyzed from samples collected on July 22-23, 1985, from this well showed significant organic contamination of ground water.

The main storm sewer, which received the TCE spill, passes directly under the Active Landfill (Site G2) and discharges into Stormwater Retention Basin No. 2 (Site G5). The following volatile priority pollutants were detected by Chester Engineers in this discharge from this sewer:

Benzene	14 ug/l
1,2-Dichloroethane	109 ug/l
1,2-Trans-dichloroethylene	109 ug/l
TCE	558 ug/l

Residual contamination is still infiltrating into this storm sewer and entering Stormwater Retention Basin No. 2.

Chester Engineers data suggest that only minor amounts of organic contaminants are crossing the Air Force Plant 6 property line to the north in the discharge from Stormwater Retention Basin No. 2. However, data presented in Tables 4.3-5 and 4.3-9 suggest that discharges of TCE

Table 4.3-9. Stormwater Retention Basin No. 2 (Site G5) Sampling Results, March 1984

Parameter (ug/l)	Influent (84-117)*	Bottom Water (84-1550)*	Sediments (84-1589)*	Effluent (84-1416)*
Benzene	14	<10	<10	<10
Chloroform	<10	97	<10	<10
1,2-Dichloroethane	109	23	<10	<10
Ethylbenzene	<10	46	<10	35
Toluene	<10	<10	35	18
1,2-Trans-Dichloroethylene	109	22	<10	<10
Trichloroethylene	558	140	<10	39

*Log number.

Source: Chester Engineers, 1984.

at levels ranging from 11.1 to 43.9 ug/l are normal. Other organic contaminants ethylbenzene (35 ug/l) and toluene (18 ug/l) have been released in the effluent. The extremely high levels of volatile organics in Well G5-5 and others suggest that low levels of TCE will be discharged offsite from Stormwater Retention Basin No. 2 via ground water for several years. Table 4.3-9 indicates a consistent low-level discharge of TCE off DAFB property into Rottenwood Creek. This level (39 ug/l) exceeds the Human Health Risk Criteria (see Table 4.1-2).

4.3.3 B-58 WING TANK SEAL TEST FACILITY (SITE G15, ZONE 3)

Bldg. B-58 is located along the northeast perimeter of Air Force Plant 6 along South Cobb Dr. and across from the city of Marietta's Wildwood Park. Operations at Bldg. B-58 include testing of C-130 wing tank seals. The solvent TCA has been used extensively at this site. A drum storage and hazardous waste accumulation area is currently located at the northwest corner of the building. Currently, no spill containment facilities exist at the site.

Well MW7, sampled by Chester Engineers on Mar. 2, 1984, was part of the reconnaissance wells survey in the TCE Spill at B-76 (Site G9). This well was considered upgradient and was not expected to be contaminated. However, the original sample and a verification sample revealed 1,1,1-trichloroethane as high as 16,700 ug/l with the secondary presence of 4,000 ug/l of 1,1-dichloroethylene. According to Lockheed-Georgia Co., there was no specific incident to account for the contamination. Additional monitoring wells were installed. Table 4.3-10 presents organics contaminant concentrations for wells at Site G15 sampled on Aug. 20, 1984.

The four additional shallow monitoring wells (MW52, MW53, MW54, and MW56) installed by Chester Engineers reached bedrock at 24 to 30 ft below land surface. As a result, existing data are not sufficient to define the extent or direction of the contaminant plume migration.

Table 4.3-10. Summary of Ground Water Analysis Data for Wells at Site G15—B-58 Wing Tank Seal Test Facility*

Monitor Well	Chloroform (ug/l)	1,1-Dichloroethane (ug/l)	1,2-Dichloroethane (ug/l)	1,1-Dichloroethylene (ug/l)	Methylene chloride (ug/l)	1,2-Trans-dichloroethylene (ug/l)	1,1,1-Trichloroethane (ug/l)	1,1,2-Trichloroethane (ug/l)	Trichloroethylene (ug/l)
MW7	<10	56	16	1,654	<10	<10	11,900	28	54
MW52	20	<10	<10	<10	35	<10	15	<10	61
MW53	19	29	33	153	34	20	767	<10	95
MW54	<10	39	16	213	<10	<10	1,550	11	56
MW56	10	<10	<10	<10	<10	<10	34	<10	44

*Samples taken on Aug. 20, 1984 are GC/MS samples.

Sources: Chester Engineers, 1984, compiled by ESE, 1985.

However, topography suggests a potential for subsurface offsite migration to the northeast toward Wildwood Park and into Rottenwood Creek (Fig. 2.5-12). Ground water may also leave the site by flowing to the northwest toward Stormwater Retention Basin No. 2 (Site G5). The storm sewer that drains the recently paved apron around Bldg. B-58 flows northwest under the concrete C-5 parts storage pad and discharges into a stream that enters Stormwater Retention Basin No. 2 (Site G5) (Chester Engineers, 1984).

4.3.4 INDUSTRIAL WASTE TREATMENT FACILITY (ZONE 4)

Site G6--B-10 Aeration Basin and Site G10--JP-5 Fuel Spill No. 2

Ground-water contamination was indicated by the quarterly samples obtained on Apr. 23, 1984, and verified by samples obtained on June 5 and 6, 1984. Concentration differences existed between the upgradient (MW22) and downgradient (MW23,24, and 25) monitoring wells as indicated on Table 4.3-11.

The following monitoring wells were installed in the B-10 Aeration Basin (Site G6): MW22 (upgradient) and MW23, MW24, MW25, and MW9 (downgradient). Table 4.3-11 presents data for wells around the B-10 Aeration Basin.

Four designated RCRA wells initially were sampled on Apr. 23, 1984, and high levels of organic contamination were discovered. The wells were resampled on June 4 and 5, 1984, and higher levels were detected. For example, on June 4, 1984, at MW25, the TCE was 12,400 ug/l, TOX was 8,500 ug/l, chloroform was 620 ug/l, and 1,2-dichloroethylene was 1,300 ug/l. The B-10 Aeration Basin underdrain system also contained a high level of TCE (6,480 ug/l) and chloroform (100 ug/l).

The sedimentation pond receives surface runoff from the treatment plant area. This pond was found to contain some organics, with tetrachloroethylene the highest at 124 ug/l. Thus, the sedimentation pond (catch basin) is a potential source of organics discharges to surface waters

Table 4.3-11. Analytical Results for B-10 Aeration Basin (Site G6)

Date	Ground Water Well No.	pH (units)	Specific Conductivity (umho/cm)	TOX (ug/l)	TOC (mg/l)	Chloro- form (ug/l)	Trichloro- ethylene (ug/l)	1,2- Dichloro- ethylene (ug/l)	Trans- 1,2-Dichlor- oethane (ug/l)
04/23/84	22	7.5	90	180	3	ND	ND	ND	ND
06/04/84	(upgradient)	ND	ND	6	ND	ND	ND	ND	ND
08/10/84		6.8	66	16	6	ND	ND	ND	ND
04/23/84	23	7.3	535	117	12	ND	ND	ND	ND
06/04/84	(downgradient)	ND	ND	7	ND	24	ND	ND	ND
08/10/84		7.4	645	38	12	ND	ND	ND	ND
04/23/84	24	6.7	450	190	19	ND	98	125	140
06/04/84	(downgradient)	ND	ND	110	ND	ND	130	172	162
08/10/84		7.2	630	84	30	ND	ND	ND	ND
04/23/84	25	6.4	800	11,300	24	110	2,500	870	940
06/04/84	(downgradient)	6.7	ND	8,500	ND	620	12,400	1,250	1,300
08/10/84		ND	1,080	2,550	50	ND	ND	ND	ND
06/05/84	9 (downgradient)	ND	ND	ND	ND	ND	ND	ND	66
06/05/84	B-10 Underdrain System	ND	ND	3,000	ND	100	6,480	173	196

ND = No data available.

Note: A blank space means less than detection limits of 10 ug/l.

Source: Chester Engineers, 1984; compiled by ESE, 1985.

and ground waters. According to Lockheed-Georgia Co., overflow from this catch basin flows untreated to a storm sewer and directly into Big Lake on DAFB.

The sediments in the B-10 Aeration Basin (Site G6) were also sampled and analyzed in April 1984 (see Table 4.3-12). Chromium, barium, cadmium, and lead data from EP toxicity testing of sediments as well as total concentrations were sufficiently high to be of potential leachate concern if pH values were to drop from the current range of 7.8 to acidic levels. Biological degradation of the waste may create organic acids that have the propensity to reduce the pH. Significant concentrations of organics were also detected in the sediments. These compounds will also migrate into ground waters.

Water quality within the B-10 Aeration Basin does not exhibit levels of the metals or volatile organics present in the sediments. However, this is not unreasonable since the pond is continuously aerated by one or two surface aerators. Aeration of organics, precipitation of heavy metals from treatment, anaerobic degradation, and possible dilution by rain and influent may have appeared to reduce the concentrations of those compounds in the surface water located within the B-10 Aeration Basin.

Two old operations, a paint strip operation and the temporary Chem Mill facility at the B-10 Aeration Basin (Site G6), have unmeasured impacts on ground-water quality. Contamination could also come from current operations near the Chem Mill and MW9. According to Chester Engineers, a paint strip operation using an acid/caustic solution vs. strip zinc chromate primer from paint racks has visible spillage with a high potential of runoff occurring from this site. Spillage would flow toward the B-10 Aeration Basin, monitoring Well 9, or the catch basin.

Other potential activities causing contamination may be spillage and runoff sources from the hazardous waste storage area and the waste oil incinerator, which, based on past operating conditions, may have contributed to some organic residual contamination. According to

Table 4.3-12. Sediment Sample Results for B-10 Aeration Basin (Site G6)

Date	Basin Sediments	Total Concentration (ppm)	EP Toxicity (ppm)
04/05/84	Heavy Metals:		
	Cyanide	3.1-5.7	<0.005-0.008
	Cadmium	18-72	0.02-0.15
	Total chromium	2,200-6,000	0.03-3.7
	Hexavalent chromium	1.0-6.4	<0.02
	Lead	10-72	0.1-0.28
	Barium	20-6,050	0.1-182
	Organics:		
	Chlorobenzene	50 ug/1	
	1,2-Dichloroethane	<10-450 ug/1	
	Ethylbenzene	<10-720 ug/1	
	Methylene chloride	23-250 ug/1	
	Toluene	11-1,350 ug/1	
	Tetrachloroethylene	<10-700 ug/1	
	Chloroform	13-58 ug/1	
	Trichloroethylene	<10-7,420 ug/1	
	1,2-Trans-Dichloroethylene	<10-440 ug/1	

Note: A blank space means less than detection limits of 10 ug/1

Note: Surface sediment sampling collected for aeration basin on April 4, 1984. Basin was divided into five sections. Sediment samples were collected using a weighted KB design sediment corner dropped from a boat. This procedure obtained samples to a maximum depth of 24 inches. Complete results are in Appendix (see Chester Report, 1984).

Source: Chester Engineers, 1984; compiled by ESE, 1985.

Chester Engineers, an additional source of organic contamination of ground water may be present at an unknown upgradient source. In addition, visual evidence exists of chemical spillage near the railroad spur chemical unloading area adjacent to the B-10 Aeration Basin.

Chemical and geohydrological data suggest that a plume is extending in an easterly direction under the taxiway to the tributary to Big Lake on DAFB. A second plume may be moving in a southeasterly direction under the truck fuel farm (near Site G10).

Since potential contamination may extend beyond the existing well network, additional monitoring wells are required to define the horizontal and vertical extent of contamination.

Lockheed-Georgia Co. has proposed an extensive Ground Water Quality Assessment Plan for the IWTP, especially the B-10 Aeration Basin as a RCRA-regulated facility. The plan (Chester Engineers, Nov. 30, 1984) proposes an extensive investigation at the site, including ground water, surface water, sediment, and soil sampling and analysis, a resistivity survey, 12 new shallow and bedrock monitoring wells, and an analysis of closure options for the area. The plan is currently being reviewed by Georgia EPD and implemented by the IT Corporation.

<u>Truck Fuel Farm Near Site G10--JP-5 Fuel Spill No. 2</u>--The wells in the fuel farm area (near Site G10) were sampled by Chester Engineers during their reconnaissance survey to assess the impact of the fuel line spill. Table 4.3-13 presents a summary of the only data available for Wells A-1, A-2, B-1, B-2, B-4, B-5, B-8, and B-9. pH and conductivity values are presented in Figs. 4.3-2 and 4.3-3, respectively. There appears to be a clearly defined southeasterly ground water flow direction away from the B-10 Aeration Basin (Site G6). The JP-5 Fuel Spill No. 2 migrated in this southeasterly direction to the storm sewer and was temporarily dammed to recover the fuel; however, some overflow eventually reached Big Lake on DAFB. No visible evidence of any fuel

Table 4.3-13. Analytical Summary Table for Truck Fuel Farm

Monitoring Well No.	pH (standard units)	Conductivity (umhos/cm)
A-1	5.66	75
A-2	5.47	200
B-1	5.86	270
B-2	6.03	250
B-4	6.89	500
B-5	5.31	52
B-8	5.23	34
B-9	5.24	38

Sources: ESE, 1985.
Chester Engineers, 1984.

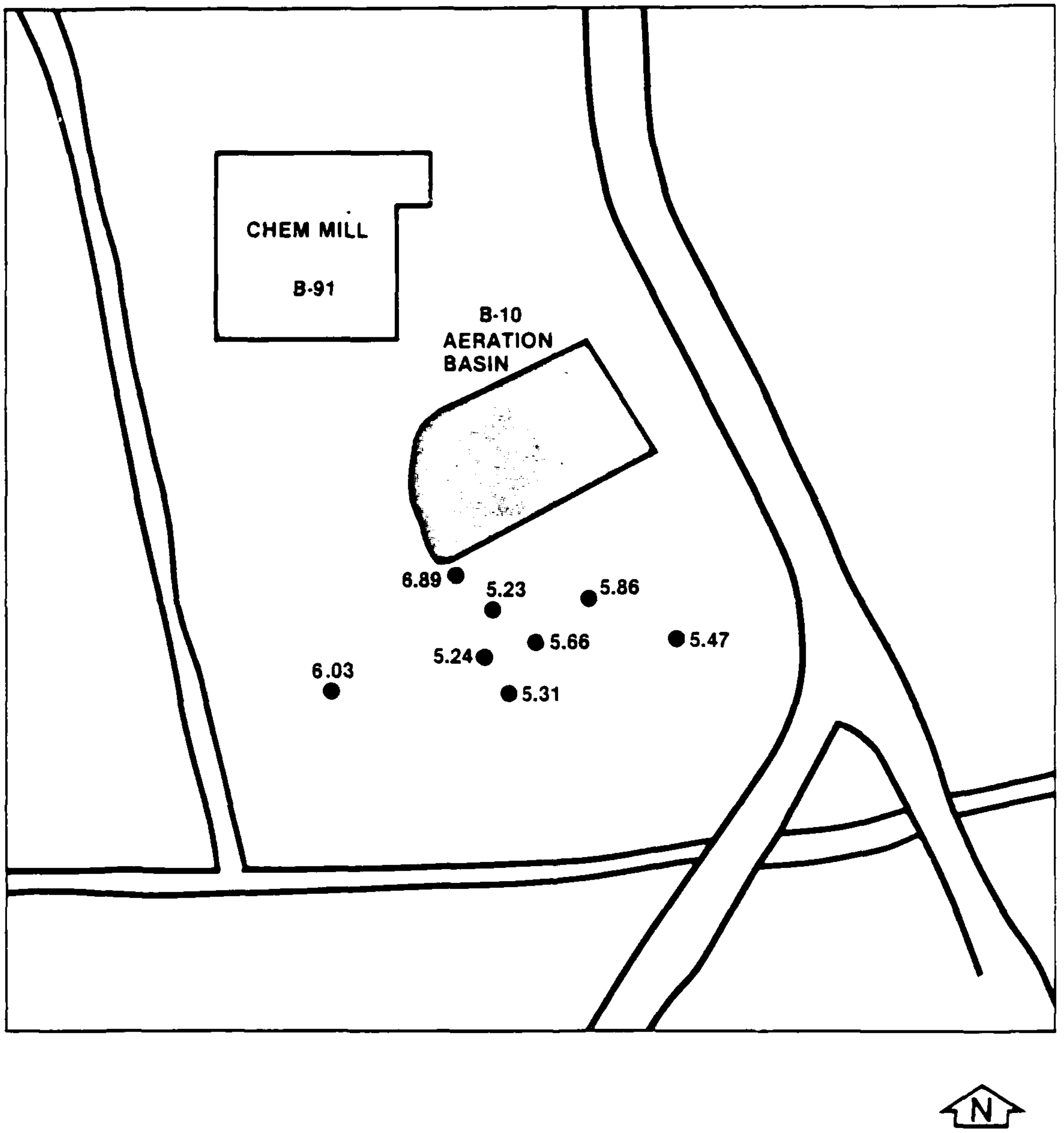

Figure 4.3-2
pH OF SITES G-10 AND G-6

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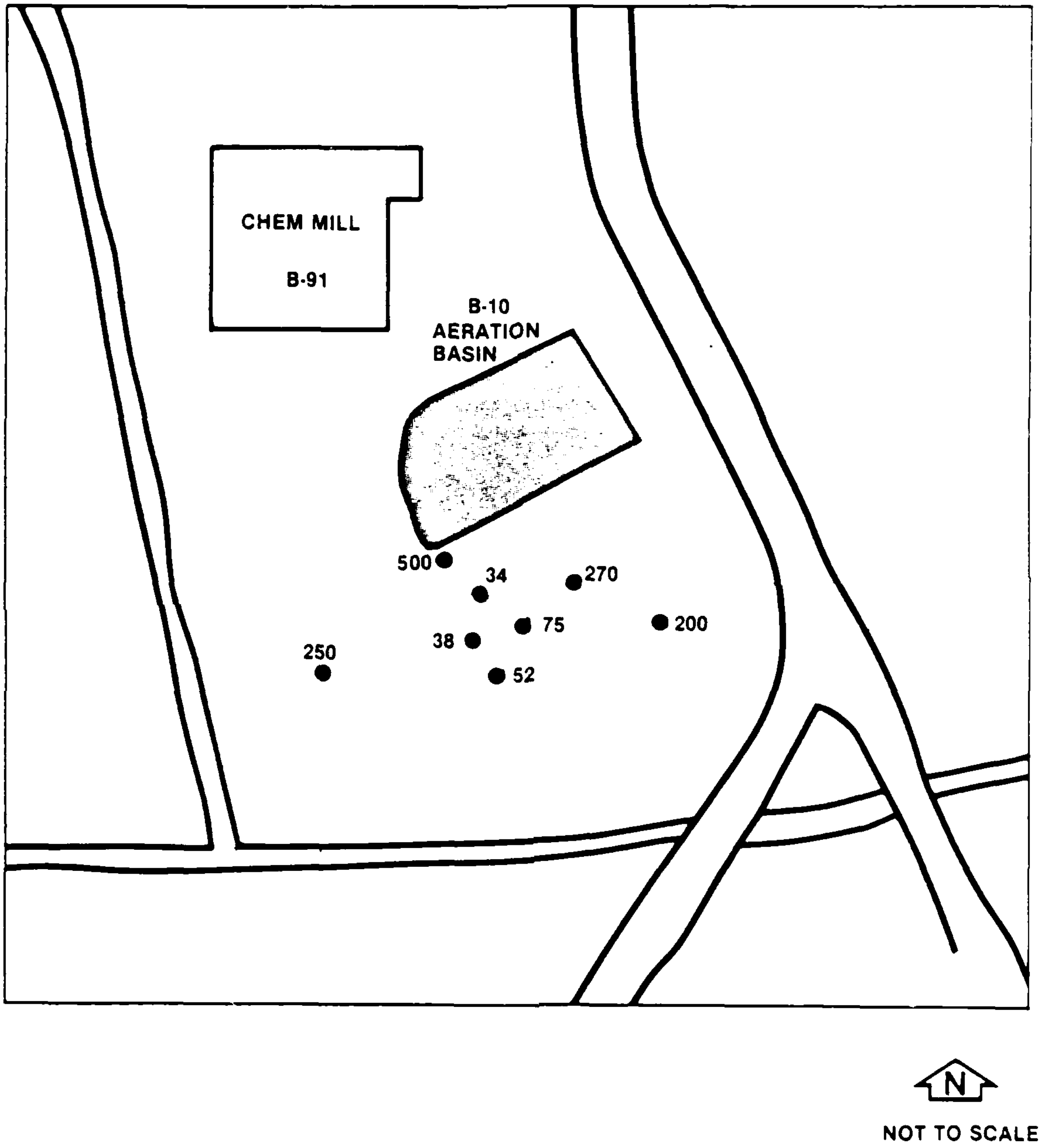

Figure 4.3-3
CONDUCTIVITY OF SITES G-10 AND G-6

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contamination reaching the ground water and no organic analytical data were located by ESE. The ground-water-monitoring plan for the B-10 Aeration Basin proposes sampling and analyzing the wells at this site.

4.3.5 C-5 FLIGHTLINE AREA (ZONE 5)

This area encompasses six IRP Phase II sites:

1. Site G7 (Position 65--C-5 Wash Rack Ponds),
2. Site G11 (JP-5 Fuel Spill No. 1),
3. Site G12 (Position 71--Sodium Dichromate Spill),
4. Site G13 (Position 58--Fuel/Defuel Station),
5. Site G14 (Position 19--Fuel/Defuel Station), and
6. Site G16 (B-104 Gas Pump Station).

Fig. 4.3-4 shows the suspected pathways of contaminant flow via surface and subsurface drainage at each of the sites. The situation at each site is discussed in detail in the following subsections.

<u>Site G7--Position 65--C-5 Wash Rack Ponds</u>

The C-5 Wash Rack Ponds receive wastewater from Flightline Position 65. Operations at this site were initiated in 1964 to wash and strip paint from C-141 aircraft for the wing modification program. These operations generated spent Stoddard solvent, drycleaning solution, Turco fabri-film remover, paint strippers, hydraulic fluids, and emulsion cleaners. These wastewaters are collected by floor drains and pumped to the ponds.

The smaller, lower pond receives water from the floor drain system, and the upper pond receives effluent from the API oil/water separator and wastewater from Bldgs. B-88, B-89, and T-563 (see Fig. 4.3-5). The ponds are unlined.

[illegible] chloride was the major organic constituent in the C-5 Wash [illegible]. Extremely high levels in both unlined ponds indicate that [illegible] have the potential to migrate into ground waters. [illegible] and MW34 showed only minor amounts of methylene chloride

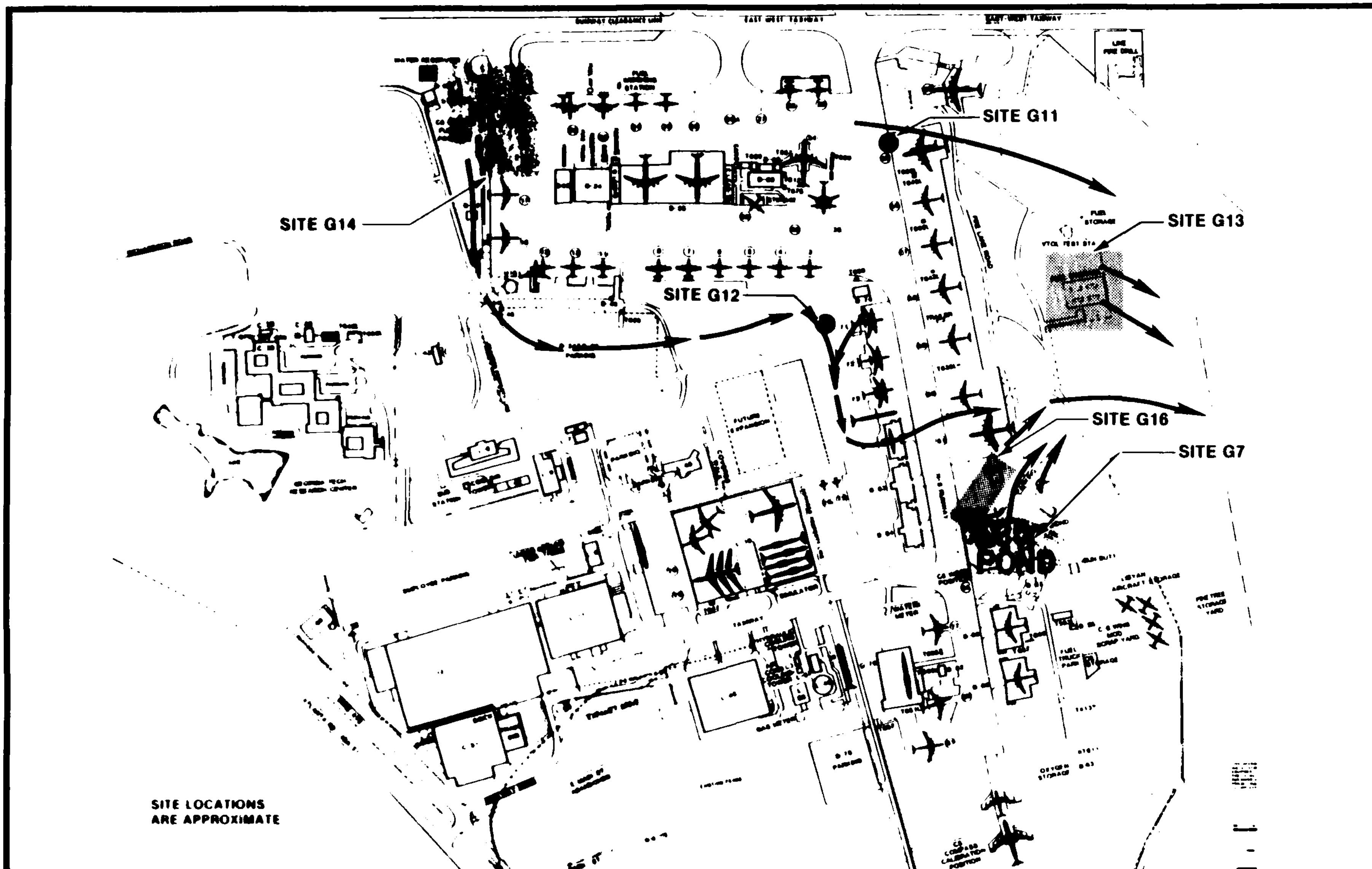

Figure 4.3-4
C-5 FLIGHTLINE AREA—GENERAL DRAINAGE

SOURCE THE CHESTER ENGINEERS, 1984

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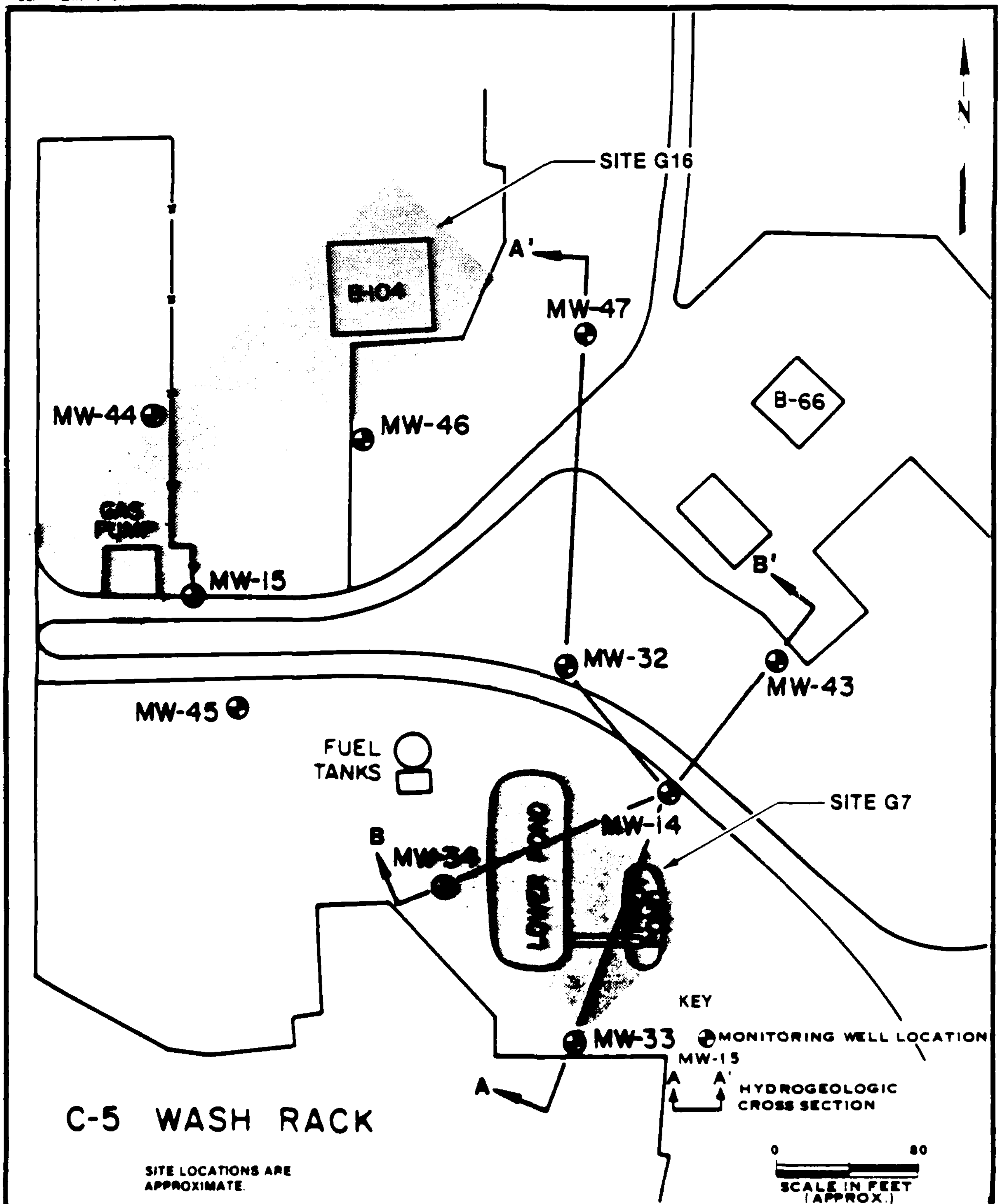

Figure 4.3-5
LOCATION OF SITE G7—POSITION 65—C-5 WASH RACK PONDS

SOURCE: THE CHESTER ENGINEERS, 1984.

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(75 ug/l and 71 ug/l, respectively). Benzene (1,130 ug/l) and toluene (130 ug/l) were detected in samples from MW32 and were also detected in MW15. Both wells are near the C-5 Wash Rack Ponds, and these contamination levels are uncharacteristic of the area. These data indicate a gasoline/fuel leak.

Unexpected results were encountered in MW14 and MW15 which are downgradient of the ponds. Volatile organics were not found in MW14; however, MW15 had significant levels of benzene (1,500 ug/l) and toluene (1,350 ug/l), as indicated in Table 4.3-13. These results indicate that MW15 is not impacted by the C-5 Wash Rack Ponds, and another contamination source is indicated. The adjacent gasoline storage tank area (G-104) is a potential contamination source. The two aboveground automotive gasoline tanks have unknown water quality influence on the northwestern corner of the C-5 Wash Rack Ponds. MW32 is substantially upgradient from MW15, thereby eliminating the underground gas tank and pumps and also the C-5 Wash Rack Ponds as a contamination source. No gasoline spills have been documented to date.

The C-5 Wash Rack Ponds represent a high-risk contaminant source, since both ponds are unlined and have confirmed organic contamination, but insignificant concentrations of pond contaminants are found in the ground water. Different contaminants may occur within the plume because the chemical profile of the pond and various spillages change with operational requirements. Georgia EPD has required Lockheed-Georgia Co. to list the C-5 Wash Rack Ponds as a RCRA- regulated unit. Lockheed intends to close these ponds. Therefore, a Ground Water Quality Assessment Plan is currently being developed by Chester Engineers. Monitoring wells MW32, MW33, and MW34 were installed for RCRA monitoring purposes.

Sampling of the pond water, sediments, and soils indicated high concentrations of organics are present. Methylene chloride is the major organic contaminant in the C-5 Wash Rack Pond water samples and sediments. Table 4.3-14 contains water quality analytical results.

Table 4.3-14. Summary of Analytical Results for Site G7—Position 65—C-5 Wash Rack Ponds

Sample Location	TOX (ug/l)	Conductivity (umhos/cm)	pH	Methylene Chloride (ug/l)	TCE (ug/l)	Toluene (ug/l)	Benzene (ug/l)	Chromium* (mg/l)
MW14	25	26	6.0	<10	<10	<10	<10	<0.005
MW15	33	53	5.8	<10	37	1,350	1,500	<0.005
Upper Pond Water Sample	75	110	6.5	91	96	<10	<10	0.04
Upper Pond Sediment Sample (3/8/84)	1,384	640	7.2	474	<10	<10	<10	2.4
Lower Pond Water Sample (3/6/84)	555	140	7.0	75,000	95	53	<10	1.9
Lower Pond Sediment Sample	651	375	6.6	595	<10	<10	<10	0.20
MW32	93	32	5.8	<10	45	130	1,130	<0.003
MW33	65	44	4.2	75	<10	<10	<10	<0.003
MW34	43	32	6.0	71	<10	<10	<10	<0.003

*Water Extract Method (ASTM Method A).

Source: Chester Engineers, 1984.
Compiled by ESE, 1985.

Chromium, at 2.4 mg/l for the upper pond sediment and 1.9 mg/l in the lower pond water, is the only significant heavy metal.

Site G11--JP-5 Fuel Spill No. 1

The JP-5 Fuel Spill No. 1 occurred at approximately Flightline Position 55 where 25,000 gal was spilled onto the flightline and flowed through a concrete sewer into Rottenwood Creek. Approximately 90 percent of the spilled fuel was recovered according to past reports (CH2M Hill, 1984). The Phase I IRP investigators did not consider this site a current environmental concern or a potential contamination threat.

Analytical results from the surface soil samples collected by ESE on Feb. 25-27, 1985, for Phase II, Stage 1 indicated 96.6 ug/g of petroleum hydrocarbons was present, confirming that a slight residual may still exist from this spill incident. This very low level of hydrocarbon is not a significant contamination source, and it should biodegrade.

Site G12--Position 71--Sodium Dichromate Spill

The Phase I IRP report recommended further work in this area due to a ruptured water main from the C-40 reservoir. Sodium dichromate ([illegible] ppm) was used for corrosion/scale prevention of the firewater supply pipeline system. Further, chromium contamination was suspected due to one water sample taken just after the spill, with total chromium concentrations between 6 and 8 ppm in Rottenwood Creek.

ESE/Law project team members installed and twice sampled four shallow ground-water-monitoring wells on Feb. 25-27, 1985, and July 23-24, 1985. ESE's field team also collected three surface soil samples in the vicinity of the previous ruptured water main.

Analytical results for both the ground water and soil samples are summarized in Tables 4.3-15 and 4.3-16.

Table 4.3-15. Summary of Analytical Results for Site G12--Position 71--
Sodium Dichromate Spill*

Parameter	Units	Well Identification 12-1	12-2	12-3	12-4	Soil Sample 11-1
Ground Water Samples						
Total chromium	mg/l	0.016	0.016	0.008	0.004	
Oil and grease	mg/l	<0.8	4	<0.7	<0.7	
pH	Standard units	5.7	5.4	6.4	5.3	
TOC	mg/l	18.3	8.6	2.8	3.8	
Specific conductivity	umhos/cm	253	587	177	225	
TOX	ug/l	480	120	24	62	
Surface Soil Samples						
EP toxicity--chromium	mg/l	<0.002	<0.002	<0.002		
Moisture	% (wet wt)					25
Petroleum hydrocarbon	ug/g					96.5

*Sampling dates are Feb. 25-26, 1985.

Note: Blank indicates no data.

Source: ESE, 1985.

Table 4.3-16. Summary of Ground Water Analyses from Site G12 (Position 71--Sodium Dichromate Spill), Second Sampling*

Parameter	Units	Well Identification G12-1	G12-2	G12-3
pH	Standard units	6.00	6.30	5.70
Specific conductivity	umhos/cm	458	843	194
TOX	ug/l	240	8.5	23
Trans-1,2,-Dichloroethylene	ug/l	550	<1.0	<1.0
Trichloroethylene	ug/l	77	<1.0	<1.0
Vinyl chloride	ug/l	87	<1.0	<1.0
Remaining EPA Method 601 Analytes	ug/l	<2.0	<2.0	<2.0

*Samples were collected on Feb. 22-23, 1985.

Source: ESE, 1985.

Total chromium values in the monitoring wells were all well below the 0.05-mg/l MCL for drinking water. No chromium was found in any of the soil samples using the EP toxicity testing procedures. However, high TOX values were found in MW G12-1 (480 ug/l), and moderately high values in MW G12-2 (120 ug/l) and MW G12-4 (62 ug/l). Specific conductivity was higher than normal ranges at Air Force Plant 6, and the presence of TOC was indicated. The high values of TOX may be due to halide salts matrix interference, since conductivity values were also elevated.

A second sampling of all Site G12 monitoring wells was conducted to determine the relationship between TOX values and volatile organics by EPA Method 601 halocarbon analytes. These data are summarized in Table 4.3-16. Low levels of volatile organics were detected. However, the cause of the contamination is not known.

The second sample from MW G12-1 contained the following organic contaminants: trans-1,2-dichloroethylene (550 ug/l), TCE (77 ug/l), and vinyl chloride (87 ug/l) from the spectrum of EPA Method 601 halocarbon analytes. The MW G12-2 sample had a TOX value of 85 ug/l but no detectable halocarbon analyte. However, a high conductivity value (843 umhos/cm) was detected.

No solvents have been documented at Flightline Position 71. However, results from MW G12-1 indicate a contamination source is migrating to the drainageway.

Site G13--Position 58--Fuel/Defuel Station

This site is part of the active fueling of C-5 airplanes on the flightline. A partially buried 30,000-gal tank with associated fuel lines and pumps is located at this station. A small drainageway is located 50 ft downgradient. During their reconnaissance survey, Chester Engineers found visible indications of fuel in the adjacent monitoring Well 13. Four additional wells were installed to define the nature and extent of the problem (MW48, MW49, MW50, and MW51).

According to Chester Engineers, an active fuel leak appears to exist at the underground tank. The leak appears to be worsening, with 18 inches of fuel oil appearing in MW13. In September 1984, stream quality leaving the area was not visibly contaminated. A definite possibility exists for a fuel breakout into the stream adjacent to the tank.

Table 4.3-17 summarizes the analytical results for volatile organics in the adjacent monitoring wells. At least two significantly contaminated wells are located in the Position 58 area. Fuel leakage was observed in MW13. The second well is the upgradient Well MW48, which was not expected to be impacted by leakage from the fuel tank at Position 58. However, MW48 exhibits high levels of ethylbenzene (7,920 ug/l) and toluene (3,650 ug/l). This may indicate a second jet fuel source upgradient. A complex system of underground fuel lines exists in this area, any of which could be leaking. Another contamination source could be leakage from the industrial sewer at the API oil/water separator behind Position 61.

Based on estimated hydraulic gradients by Chester Engineers, fuel can begin to seep into the drainageway at any time (Fig. 2.5-28). The lateral extent of contamination behind the aircraft ramp is still not well defined. Further monitoring is required to define the plume. This site should be classified as an active, ongoing spill site with remedial actions implemented.

Site G14--Position 19--Fuel/Defuel Station

Two 30,000-gal underground jet fuel storage tanks are located at Position 19. A drainageway runs from north to south behind Position 19. During the preliminary inspection and sampling on Mar. 9, 1984, Chester Engineers detected a strong chemical odor with 0.25 inch of fuel in MW18. Consequently, MW18 was sampled for oil and grease (freon extractable), and a moderately high concentration of 419 mg/l was detected (see Table 4.3-18).

Table 4.3-17. Summary of Analytical Results for Organic Contamination at Site G13--Position 58--Fuel/Defuel Station*

Monitor Well	Benzene (ug/l)	Chloro-benzene (ug/l)	Ethyl-benzene (ug/l)	Tetra-chloro-ethylene (ug/l)	Toluene (ug/l)	1,1,2-Tri-chloro-ethane (ug/l)	Tri-chloro-ethylene (ug/l)
Well-13 (5646A)	<10	<10	36,800	<10	6,500	<10	<10
Well-13 (5646B)	178	1,450	6,230	130	688	1,220	<10
MW48	<10	<10	7,920	<10	3,650	<10	<10
MW49	25	181	263	51	76	<10	23
MW50	<10	<10	21	16	30	<10	25
MW51	<10	<10	<10	<10	<10	<10	34

*All samples taken on Aug. 20, 1984 are from GC/MS samples.

Sources: Chester Engineers, 1984; compiled by ESE, 1985.

Table 4.3-18. Summary of Volatile Organics Results for Site G14--Position 19--Fuel/Defuel Station*

Parameter	Well No. / Date / Log No. 84-	16, 5/16/84, 3433	18, 5/16/84, 3423	37, 5/19/84, 3439	38 5/21/84, 3424	38 8/21/84, 5637	Drain-ageway 39, 8/21/84, 5638	42 8/21/84, 5639	Downstream, 5/16/84, 3436
pH		--	6.24	3.5	6.8	--	6.5	6.02	--
Specific conductance		--	114	600	146	--	590	650	--
1,1-Dichloroethane		<10	<10	<10	26	<10	<10	165	<10
1,2-Dichloroethane		<10	<10	<10	31	<10	75	148	16
1,1-Dichloroethylene		<10	<10	<10	<10	61	26	<10	<10
Ethylbenzene		<10	<10	<10	20	75	37	33	<10
Methylene chloride		21	<10	<10	37	<10	<10	<10	<10
1,2-Trans-dichloroethylene		<10	<10	<10	15	<10	62	<10	<10
1,1,1-Trichloroethane		<10	<10	<10	167	271	866	553	<10
TCE		<10	<10	<10	<10	360	500	196	26
Oil and grease (freon extraction) (mg/l)		--	419	0.9	0.6	0.6	1.0	1.8	--

*All results in ug/l.

Note: Dashes indicate no data.

Source: Chester Engineers, 1984.

Monitoring Wells 16, 18, 37, 38, 39, and 42 are in the vicinity of Position 19. Conductivities in MW37, MW39, and MW42 are all substantially above background. Priority pollutant volatile fraction GC/MS scans were performed on Wells 16, 18, 37, 38, and the drainageway downstream of Position 19. Volatile organic analytical results from Chester Engineers are summarized in Table 4.3-17. MW38 and MW39 had TCE concentrations of 360 ug/l and 500 ug/l, TCA concentrations of 271 ug/l and 866 ug/l, respectively, and other traces of organics. Chester Engineers interpreted these results as indicating that there were minor spillages of solvents from the various ramp operations. The presence of organics is confirmed, but the source is still unknown. Organic solvent spills at Position Ramp 19 operations have not been documented, but aircrafts are fueled and maintained in this area. Obvious hydrocarbon contamination in the drainageway bed is visible.

The Chester Engineers study at Position 19 was designed to determine the extent of jet fuel contamination of the two underground tanks. According to Chester Engineers, additional monitoring wells indicated that jet fuel contamination is limited to the immediate tank area and that ground water discharges into the adjacent drainageway. Evidence of organic contamination by solvents has been confirmed by analytical results. The extent of contamination and migration rate in the drainageway are unknown.

<u>Site G16--B-104 Gas Pump Station</u>

The B-104 Gas Pump Station contains gasoline tanks and pumps located aboveground, 50 ft from the C-5 Wash Racks. There is also a 10,000-gal underground gasoline tank in this area.

MW15, located adjacent to the gas pump, was sampled during Chester Engineers' reconnaissance survey (Fig. 4.3-6). The investigation of the B-104 Gas Pump Station was prompted by the discovery of contamination at the adjacent Position 65--C-5 Wash Rack Ponds (Site G7). Five

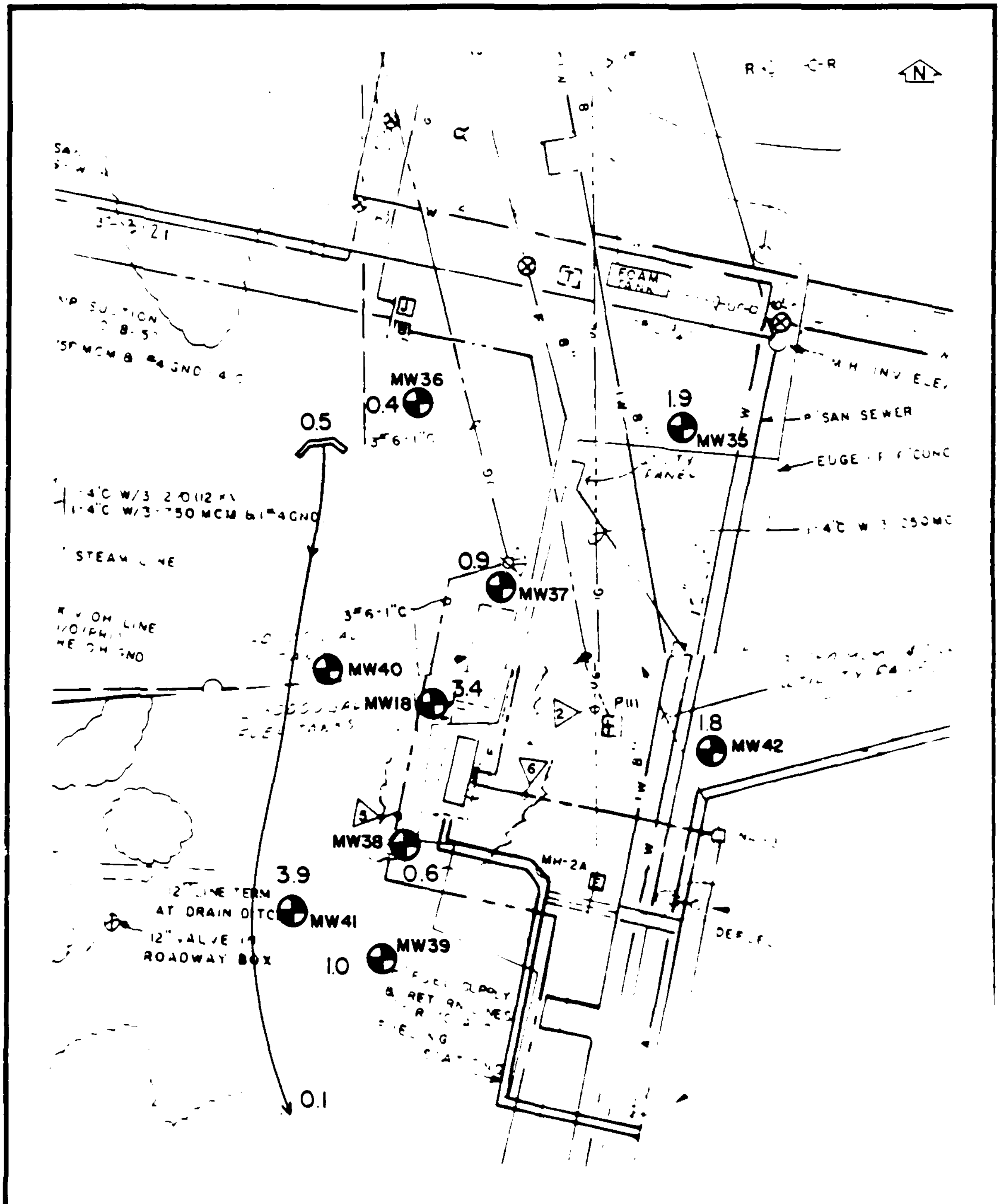

Figure 4.3-6
MONITORING WELL LOCATIONS AND FLOW DIRECTIONS FOR SITE G14—POSITION 19—FUEL/DEFUEL STATION
SOURCE: THE CHESTER ENGINEERS 1984

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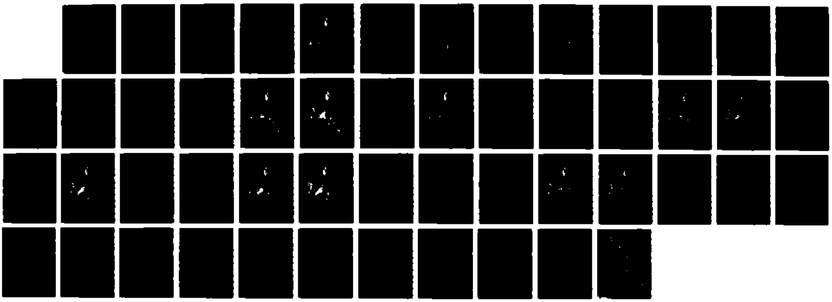

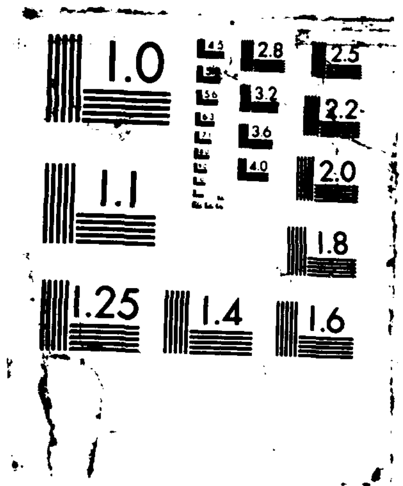
1.0
1.1
1.25
1.4
1.6
1.8
2.0
2.2
2.5
2.8
3.2
3.6
4.0

additional monitoring wells were installed. The following wells are now located within this area: MW15, MW32, MW43, MW44, MW45, MW46, and MW47.

The general direction of ground-water flow is north to northeast into the stormwater drainage headway leading into Walkers Gorge.

Moderate organic contamination by benzene (857 ug/l) was confirmed at MW32, but concentrations dropped from the initial sampling of MW15 from 1,500 ug/l to 151 ug/l. Other organic compounds detected at MW15 were toluene, ethylbenzene, and 1,2-dichloroethane. Table 4.3-19 provides volatile organic data from the Site G16 (B-104 Gas Pump Station) monitoring wells.

Samples obtained from MW32 in May 1984 indicated a significant presence of benzene (1,135 ug/l) along with some toluene (130 ug/l). These monitoring wells had no significant (>50 ug/l) volatile priority pollutants other than the fuel-derived compounds.

Contaminant levels dropped significantly, indicating no major leakage but possibly a minor spillage from local solvent or fuel sources. According to Chester Engineers, a limited area plume is contaminated with volatile organics.

The hydraulic gradients indicate a great potential for rapid dispersion of contamination over a large area. However, contamination is restricted to a small area at the present time. The source of organic contamination is still unknown. The contamination at MW15 is most likely a localized contamination not related to the Position 65--C-5 Wash Rack Ponds (Site G7).

4.3.6 GROUND WATER CONTAMINATION MODELING

Ground water modeling was conducted at Air Force Base 6, Cobb County, Ga., as part of a Phase II, Stage 1 investigation. Plant 6

Table 4.3-19. Summary of Volatile Organic Data for Site G16—B-104 Gas Pump Station

Monitor Well	Date	Benzene (ug/l)	Toluene (ug/l)	1,2-Dichloro-ethane (ug/l)	1,2-Trans-dichloro-ethylene (ug/l)	Tri-chloro-ethylene (ug/l)	Chloro-benzene (ug/l)	Hydro-carbon Content (mg/l)	Lead (mg/l)	Specific Conductance (umhos/cm)
MW-15	03/84	1,500	1,350	—	—	—	—	—	—	52
	08/13/84	151	—	66	65	24	—	—	<0.005	—
MW-32	05/84	1,135	130	—	—	—	—	—	—	31
	08/13/84	857	96	—	—	21	—	—	<0.005	—
MW-43	—	—	—	—	—	—	33	1.1	<0.005	57
MW-44	—	—	—	—	—	11	—	—	<0.005	41
MW-45	08/13/84	—	—	—	—	—	—	0.5	0.03	170
MW-46	08/13/84	—	—	—	—	31	—	—	<0.005	190
MW-47	08/13/84	—	—	—	—	—	—	—	<0.005	48

Note: Dashes indicate not detected (i.e., <10 ug/l).

Source: Chester Engineers, 1984.

has numerous contamination sites of which many contain more than one pollutant. Currently, 16 different sites have been identified; each is grouped into one of five larger zones (labeled 1 through 5).

Initially, ground water modeling was planned to evaluate contaminant migration potential at each contaminated site. Due to a lack of data, Zones 1, 3, 4, and 5 were not modeled. All modeling efforts, therefore, were concentrated on Zone 2, which is comprised of Sites G2, G5, G8, and G9. The database and ground water parameters available for Zone 2 are limited, but enough information was acquired to conduct preliminary modeling.

Five priority pollutants [trichloroethylene (TCE); 1,2-dichloroethane, toluene, benzene, and methylene chloride] were identified as posing the most immediate hazards to the environment at Zone 2. Of special concern is the site's proximity to the Air Force Base boundary. The potential for offsite contamination is an immediate concern because contamination of Rottenwood Creek produces a potential for public exposure and also provides a pathway to further offsite contamination.

Of the five priority pollutants, only trichloroethylene has a positively identified source (a March 1983 spill). The other pollutants have unknown histories and sources. Data were available for nine monitor wells located on the site. These locations in relation to the individual contamination sites and the plant boundary are presented in Fig. 4.3-7. Two additional wells, G5-5 and G5-6, were installed by ESE in July 1985. Although sampling data from these wells is useful in confirming the presence of contamination, the wells are too recently installed to provide a historical database that would contribute to modeling (see Figs. 4.3-8 and 4.3-9). The surface topography and relief of Zone 2 and surrounding offbase area are presented in Figs. 4.3-8 and

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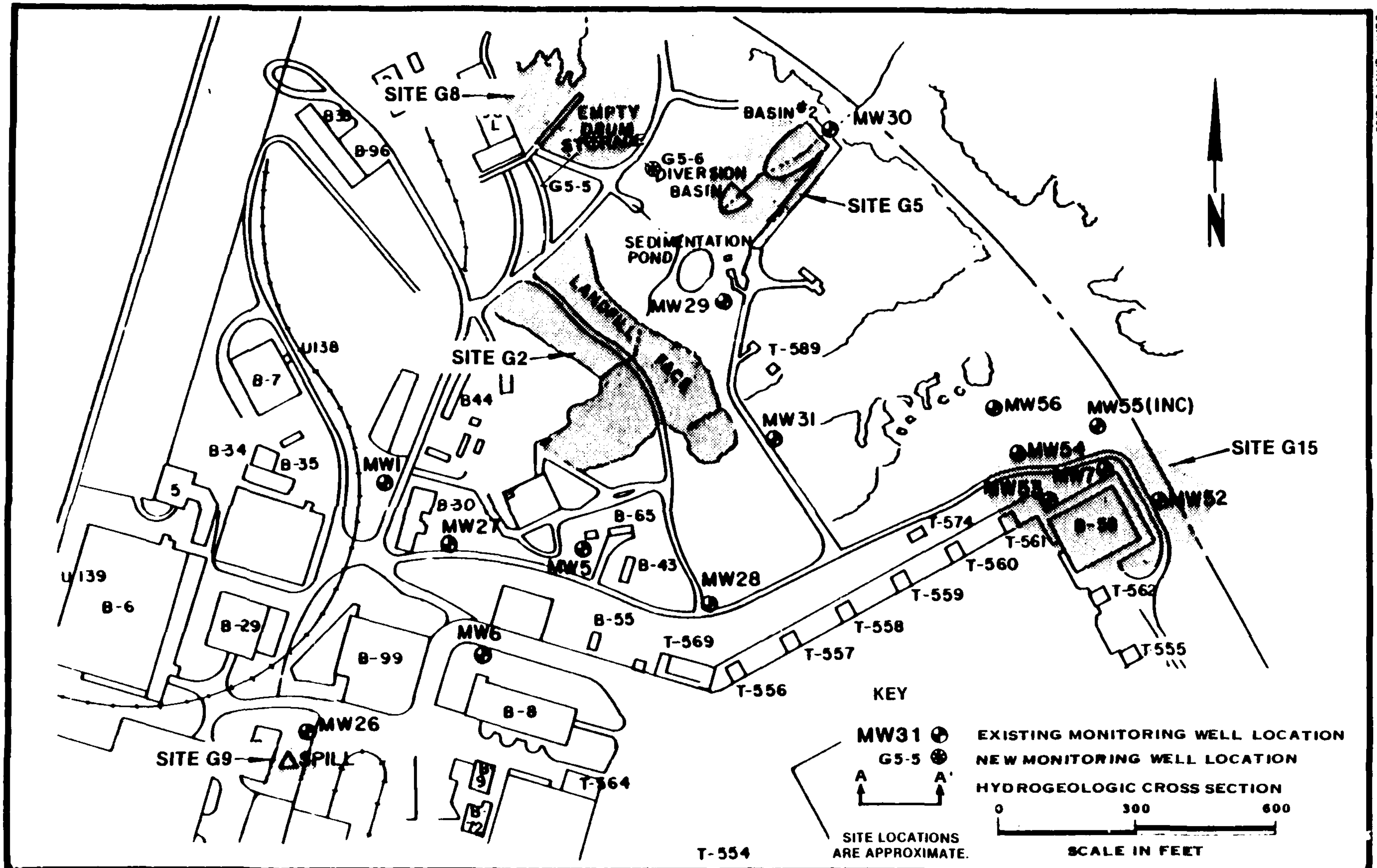

Figure 4.3-7
ZONE 2 - INDUSTRIAL FACILITIES, ACTIVE LANDFILL, AND STORMWATER RETENTION BASIN NO. 2

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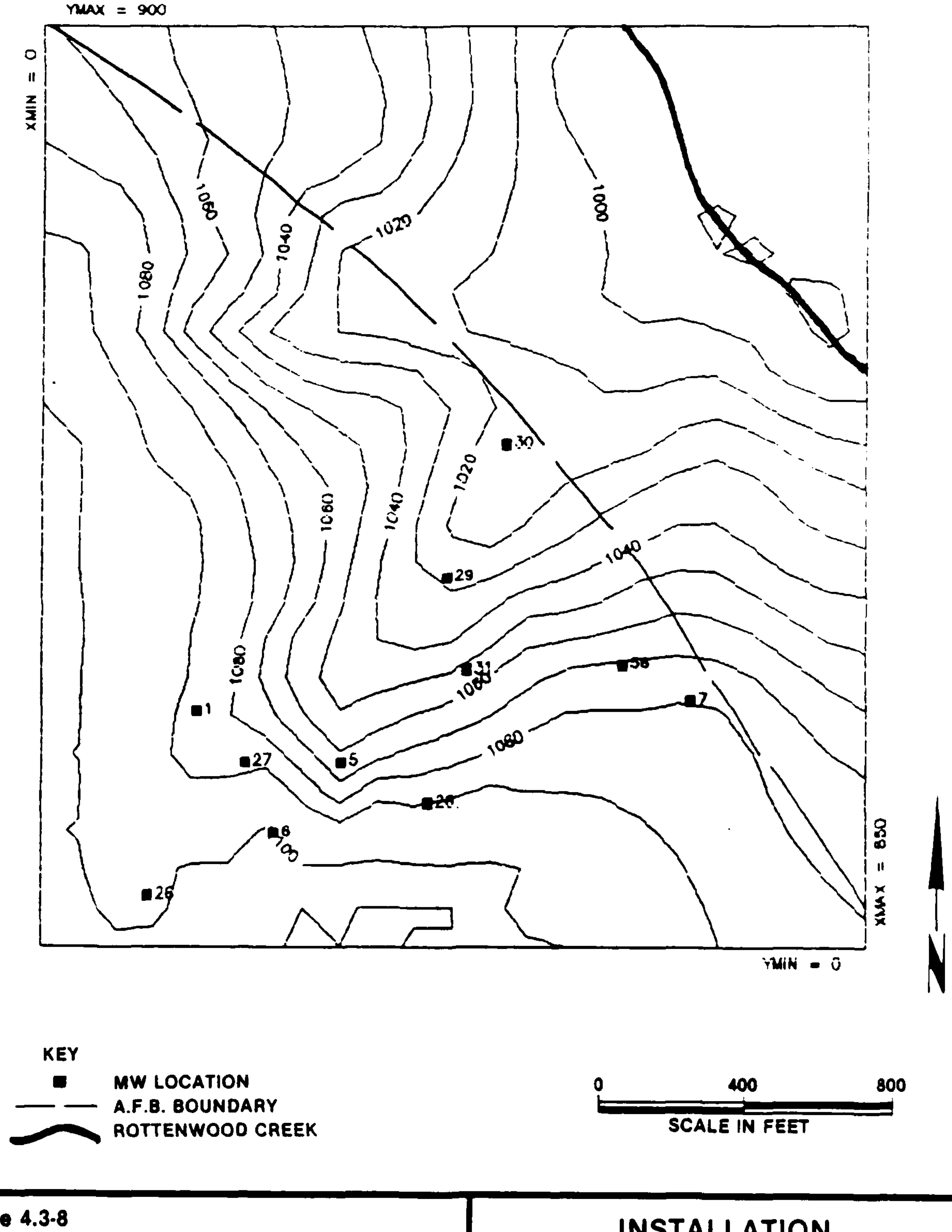

Figure 4.3-8 SURFACE ELEVATIONS (FT), ZONE 2 - INDUSTRIAL FACILITIES, ACTIVE LANDFILL, AND STORMWATER RETENTION BASIN NO. 2	INSTALLATION RESTORATION PROGRAM Air Force Plant 6

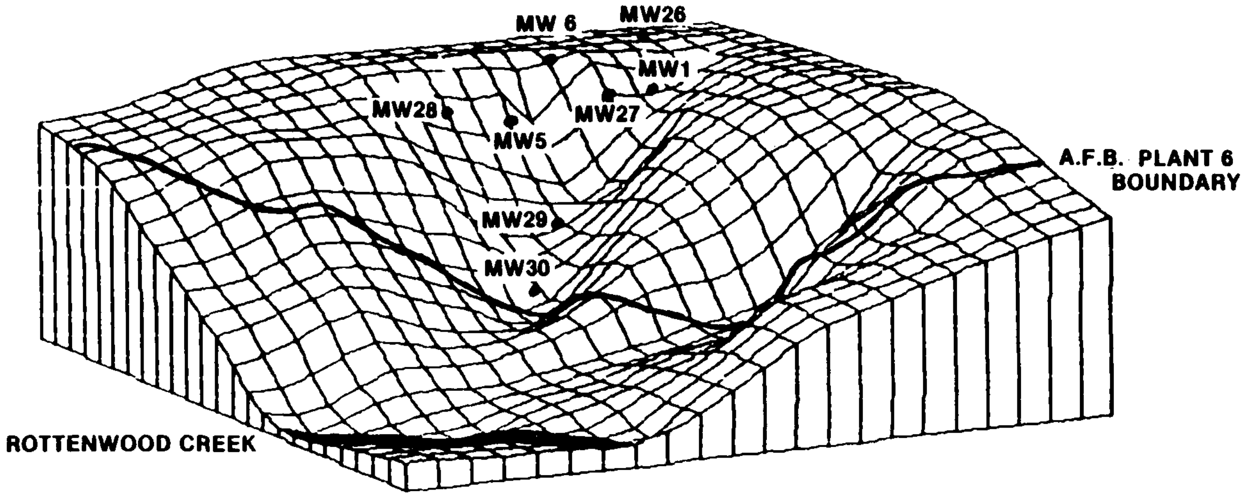

Figure 4.3-9
MONITOR WELL LOCATIONS, ZONE 2 - INDUSTRIAL FACILITIES, ACTIVE LANDFILL, AND STORMWATER RETENTION BASIN NO. 2

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4.3-9, respectively. Existing well locations are also shown in these figures. Examination of the figures reveals that surface elevations decrease steadily off DAFB to the northwest until reaching Rottenwood Creek. Two distinct valleys are present onsite. Each valley slopes at a 6-percent grade toward the offsite creek. The suspected sources (highest initial concentrations of the five pollutants) are present in or around the edge of the southernmost valley (see Fig. 4.3-10).

The potentiometric surface of Zone 2 on May 29, 1984, is presented in Figs. 4.3-11 and 4.3-12. The general ground-water-flow direction is northwest toward monitor Well 30 at an average hydraulic gradient of 0.036 ft/ft. In Fig. 4.3-13, suspected pollutant sources are shown on a 3-dimensional block diagram of the potentiometric surface at Zone 2. The suspected sources of the unknown pollutant sources are located at the position of the highest known concentration. As shown in Fig. 4.3-13, the plant boundary is directly downgradient from the suspected contamination sources. Comparison of the potentiometric surface in Fig. 4.3-12 to the surface elevations in Fig. 4.3-9 illustrates the relationship between the two. The potentiometric surface mimics the surface topography but to a lesser degree, displaying the general configuration of the ground surface but dampening the degree of local relief. This is of importance because no offbase ground water elevation data exists. Thus, the ground surface topography is important in determining the offbase direction and magnitude of ground water flow. Figs. 4.3-8 and 4.3-10 show that the ground water will continue to flow downgradient offbase until reaching Rottenwood Creek, where it may discharge into the creek.

Ground Water Contamination Model

Prickett's Random Walk ground water pollutant model (which incorporates the PLASM model) was used to simulate transport in the ground water system. The program is based on a particle-in-a cell technique for the convective mechanisms and a random walk technique for the dispersion

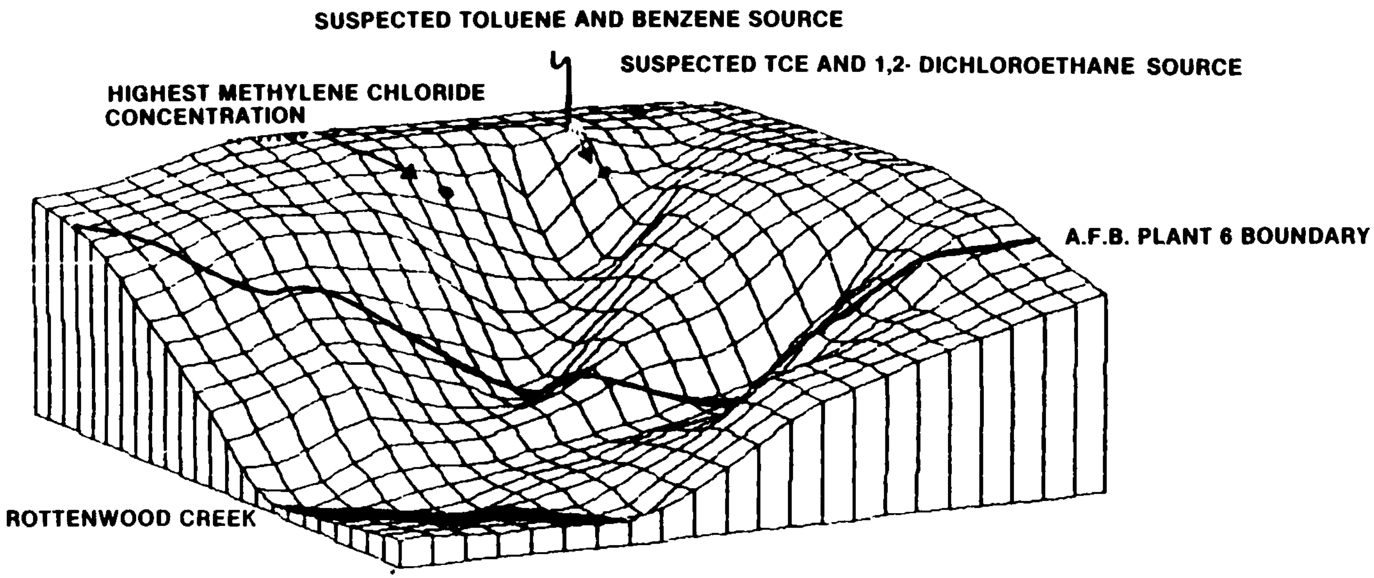

Figure 4.3-10
SUSPECTED SOURCES OF CONTAMINATION, ZONE 2 - INDUSTRIAL FACILITIES, ACTIVE LANDFILL, AND STORMWATER RETENTION BASIN NO. 2

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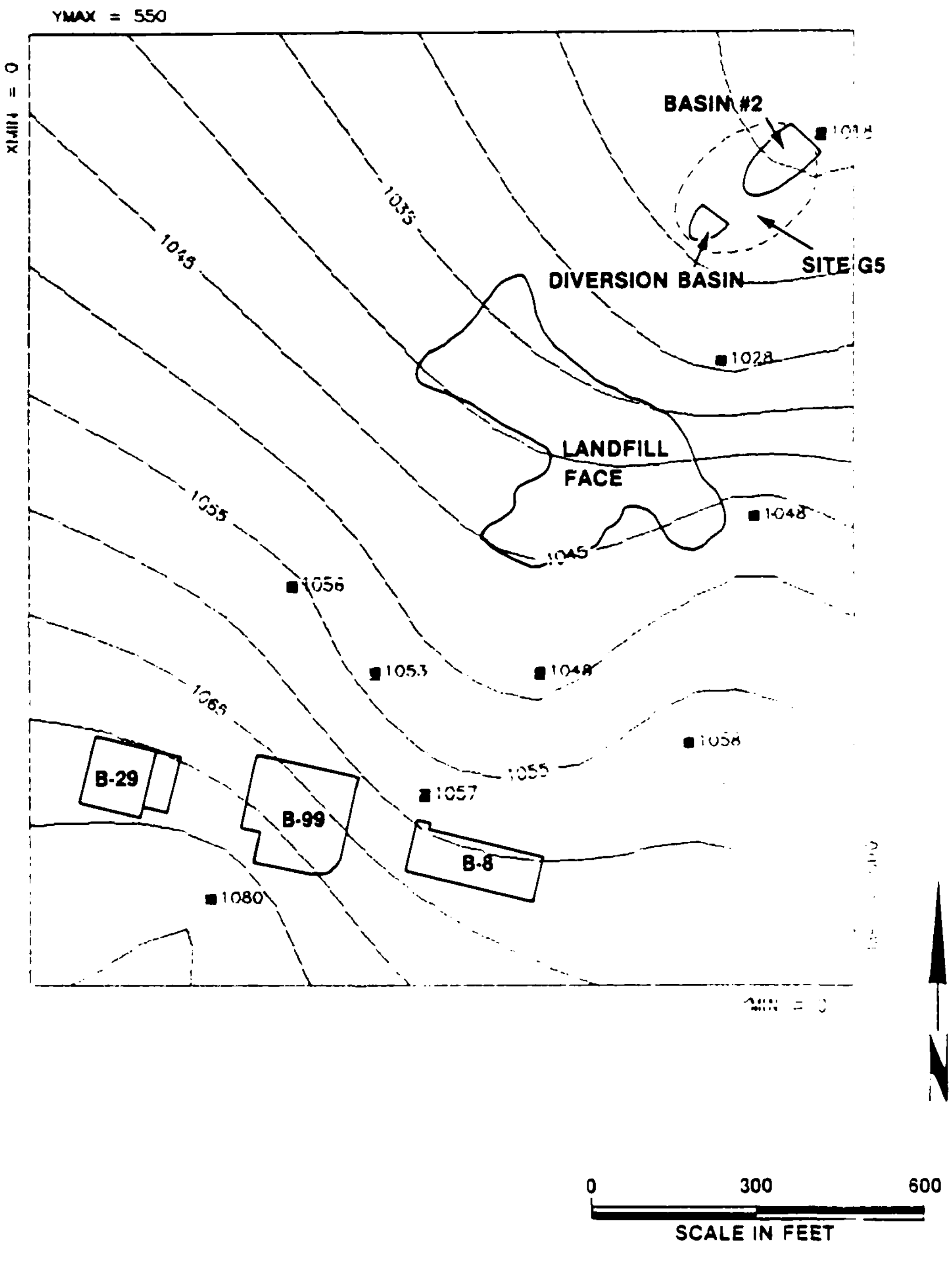

Figure 4.3-11
POTENTIOMETRIC SURFACE (FT), ZONE 2 - INDUSTRIAL FACILITIES, ACTIVE LANDFILL, AND STORMWATER RETENTION BASIN NO. 2

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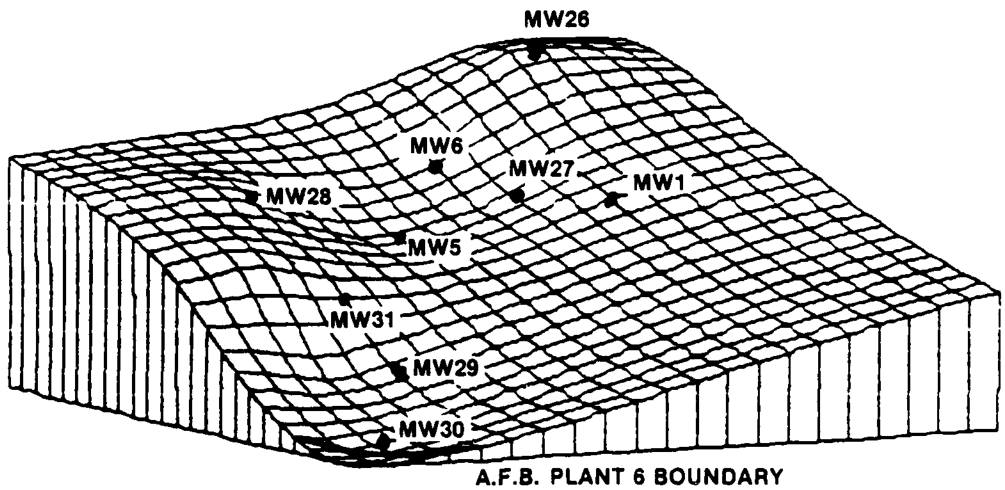

Figure 4.3-12
POTENTIOMETRIC SURFACE, ZONE 2 - INDUSTRIAL FACILITIES, ACTIVE LANDFILL, AND STORMWATER RETENTION BASIN NO. 2

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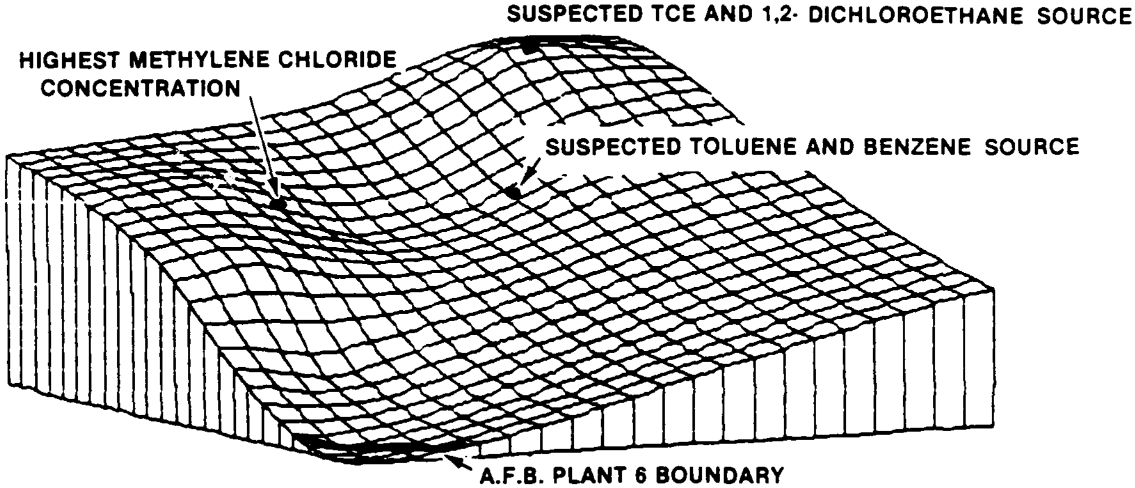

Figure 4.3-13
SUSPECTED CONTAMINATION SOURCES IMPOSED ON THE POTENTIOMETRIC SURFACE, ZONE 2—INDUSTRIAL FACILITIES, ACTIVE LANDFILL, AND STORMWATER RETENTION BASIN NO. 2

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effects. The microcomputer version was employed and run on a Zenith® 150 and a Zenith® 100. The following parameters were input into the model (see Table 4.3-20):

1. Hydraulic Conductivity--In modeling Zone 2, data from only four slug tests were available; three tests were performed by ESE at Wells G5-5 and G5-6 (see Fig. 4.3-7). Hydraulic conductivities calculated by ESE confirm the previous value of 2.54 gallons per square foot (gpd/ft^2). In units of gpd/ft^2. This is a measured parameter drived from field tests such as slug tests, pump tests, or specific capacity tests. Pump tests are preferred but are not always economically feasible. Slug tests are usually representative but may only represent the hydraulic conductivity of a small area immediately adjacent to the well tested.

2. Transmissivity--At Plant 6, the unconfined aquifer was modeled. This water table aquifer ranges from 15 to 25 ft in thickness on average, although many anomolous zones may exist. This is due to the undulating weathered bedrock surface that forms the lower boundary of the aquifer. An average thickness of 20 ft was used for modeling purposes. An additional problem involving transmissivity of Zone 2 is the relatively poor understanding of the ground water system. This problem is primarily the result of the uncertainty with regard to the extent of fracturing within the gneiss-schist bedrock and if it is fractured, what amount of flow is present and where. For initial modeling purposes, no substantial ground water flow through the bedrock was assumed.

3. Storage Coefficient--Based on the clay, silt, and sand lithology derived from the weathering of the bedrock, a value of 0.22 was selected for Zone 2 modeling (Freeze and Cherry, 1979).

4. Porosity--Studies show that unconsolidated deposits consisting of silt, sand, and clay range between 25 and 35 percent (Freeze and Cherry, 1979). The accepted standard of 30 percent was used in Zone 2 modeling.

Table 4.3-20. Prickett Random Walk Ground Water Model Parameters

Parameter	Unit	TCE	1,2-Dichloroethane	Benzene	Toluene	Methylene Chloride
Hydraulic Conductivity	gpd/ft^2	2.54	2.54	2.54	2.54	2.54
Transmissivity	gpd/ft	50.84	50.84	50.84	50.84	50.84
Storage Coefficient	dimensionless	0.22	0.22	0.22	0.22	0.22
Porosity	dimensionless	0.3	0.3	0.3	0.3	0.3
Longitudinal Dispersivity	ft	15.0	15.0	15.0	15.0	15.0
Transverse Dispersivity	ft	3.0	3.0	3.0	3.0	3.0
Retardation Coefficient	ft	0.050	0.031	0.042	0.073	0.039
Regional X-flow	ft/day	0.040	0.040	0.025	0.025	0.018
Regional Y-flow	ft/day	0.049	0.049	0.025	0.025	0.040

Source: ESE, 1985.

5. Longitudinal and Transverse Dispersivities--Due to the lack of test data in the literature concerning field dispersivities, a sensitivity analysis was employed to accurately model conditions in Zone 2. Armed with the relative values for the lithology of Zone 2, longitudinal and transverse dispersitivities were calibrated specifically for the site. A value of 15.0 and 3.0 ft was used in model runs for the longitudinal and transverse dispersivities, respectively.

6. Regional X and Y Flow--Due to hydraulic gradient differences, calculated values for each contaminant source were dependent on location. Values range from 0.044 feet per day (ft/d) in the X direction to 0.022 ft/d for the y direction. Flow rates for each pollutant are listed in Table 4.3-20.

7. Retardation Coefficient--Retardation coefficients for Plant 6 modeling runs were calculated using data from Callahan, *et al*. (1979) and Lyman, *et al*. (1982). Column experiments from laboratory tests, unfortunately, do not provide a good indication of what will take place in the field. Therefore, a sensivity analysis was employed using known travel time and distance of TCE. Once a retardation coefficient was established for TCE, a scaling factor based on the original calculated values produced the coefficients for the other four contaminants.

8. Particle Mass--In units of pounds. Particle mass allows the input of a known mass into modeling efforts. The amount of mass injected has no bearing on plume dimensions or movement but is used by the program to show pollutant distributions in a concentration map. Particle mass is only relevant when the amount (mass) of contaminant is known. In modeling Site A, particle mass was not considered because the mass of the orginal pollutants were unknown.

POLLUTANT MODELING

TCE

The location of the TCE spill is just southwest of Bldg. B-99 (see Fig. 4.3-7). Contamination concentrations of TCE at Site A recorded in May 1984 are presented in Fig. 4.3-14. The concentrations recorded at well sites reflect movement to the northeast in the direction of ground water flow. Although Fig. 4.3-9 indicates accurate concentrations between well locations, the concentrations to the west, south, and southwest are most likely inaccurate due to the lack of control points (well locations) in these areas. The 365- and 730-day projection for the TCE plume as modeled by Random Walk are presented in Figs. 4.3-15 and 4.3-16, respectively. In Fig. 4.3-16, the 730-day contamination plume modeled for March 1985 migrated off DAFB after traveling beneath the active landfill and Stormwater Retention Basin 2. Fig. 4.3-17 indicates that the TCE contamination plume has reached Rottenwood Creek. The TCE plume is confined laterally to the width of the valley beneath which it travels. Plume models further indicate that reported TCE contamination of MW G5-5 and G5-6 may be due to sources other than the TCE spill. A possible source is the empty drum storage area.

Approximately one-half of the spill was reported to have flowed overland into Stormwater Retention Basin 2. Although spill prevention control and counter measures were implemented, sampling reveals continuous low level TCE discharge from the basin in the area of Monitor Well 30. In Figs. 4.3-18 and 4.3-19, the Random Walk 180- and 365-day projections for September 1984 and March 1985, respectively, show low levels of TCE contaminating Rottenwood Creek and the surrounding park.

1,2-Dichloroethane

The source and mass of 1,2-dichloroethane is unknown, but contamination concentrations indicate a source near the TCE spill. Concentrations in Zone 2 for May 1984 are presented in Fig. 4.3-20. Again, the movement of the pollutant is northeast in the direction of the ground water flow.

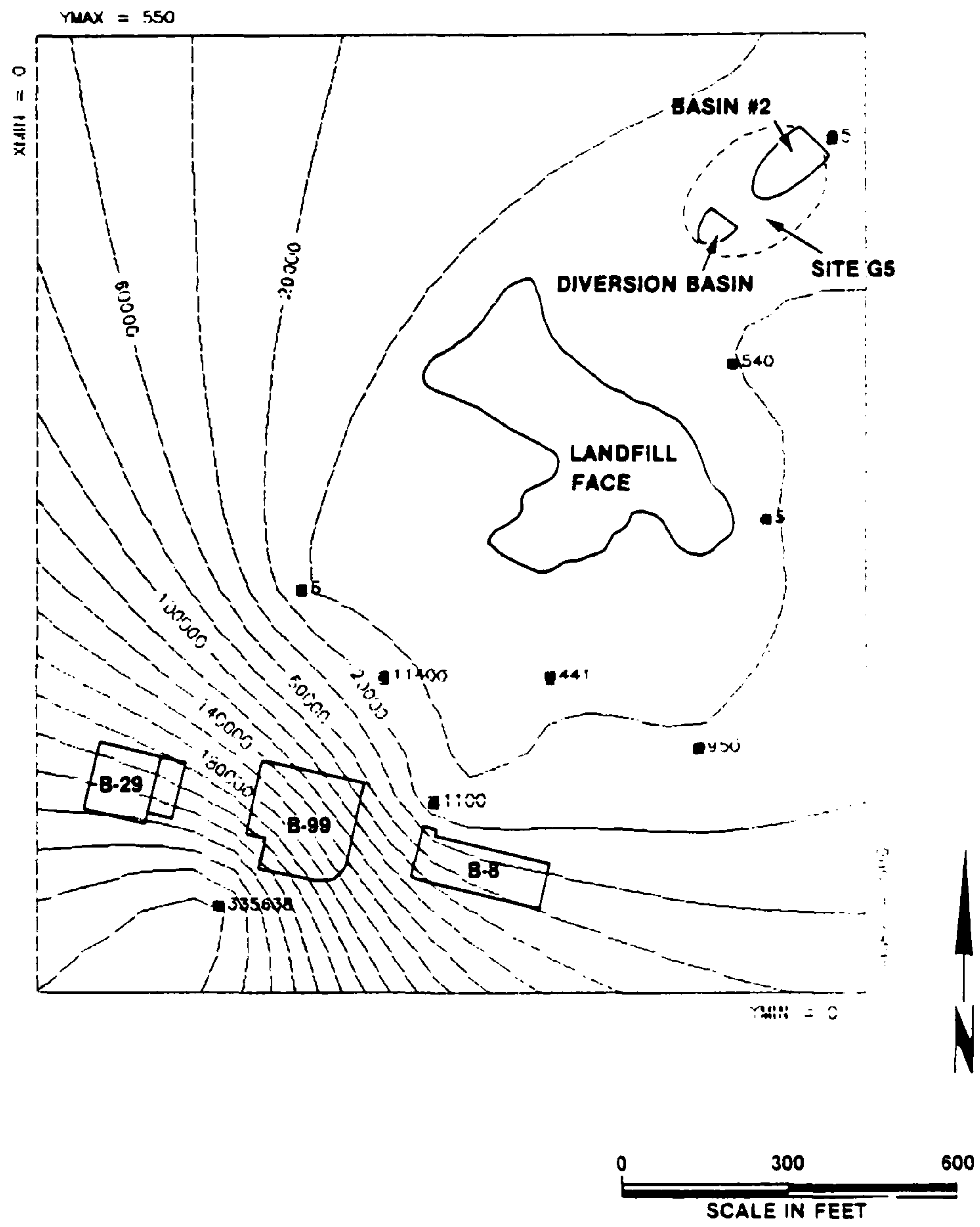

Figure 4.3-14
TCE CONTAMINATION (ug/l), ZONE 2 - INDUSTRIAL FACILITIES, ACTIVE LANDFILL, AND STORMWATER RETENTION BASIN NO. 2

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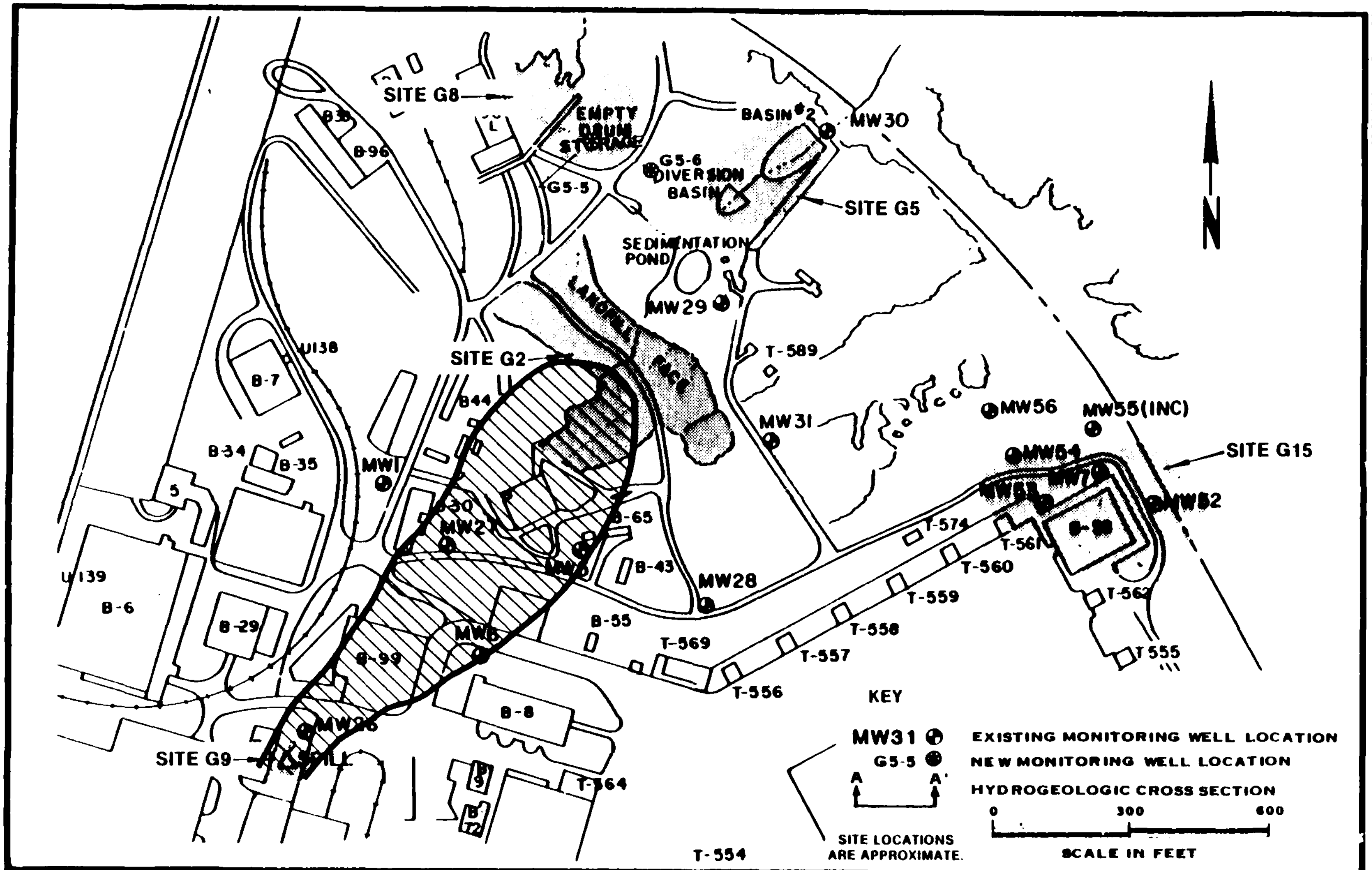

Figure 4.3-15
TCE PLUME - 365-DAY RANDOM WALK PROJECTION FOR MARCH 1984, ZONE 2 - INDUSTRIAL FACILITIES, ACTIVE LANDFILL, AND STORMWATER RETENTION BASIN NO. 2

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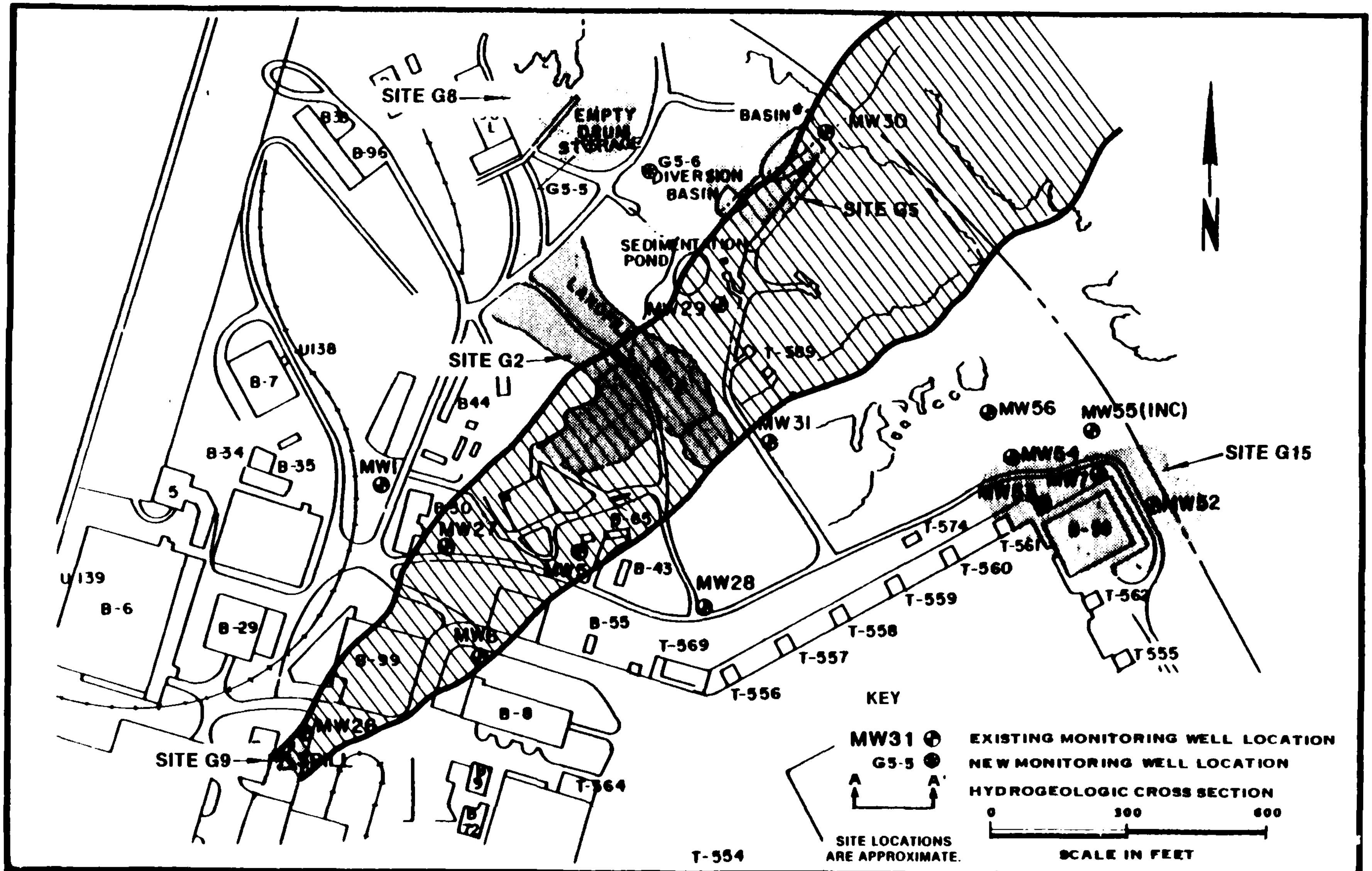

Figure 4.3-16
TCE PLUME—730-DAY RANDOM WALK PROJECTION FOR MARCH 1985, ZONE 2—INDUSTRIAL FACILITIES, ACTIVE LANDFILL, AND STORMWATER RETENTION BASIN NO. 2

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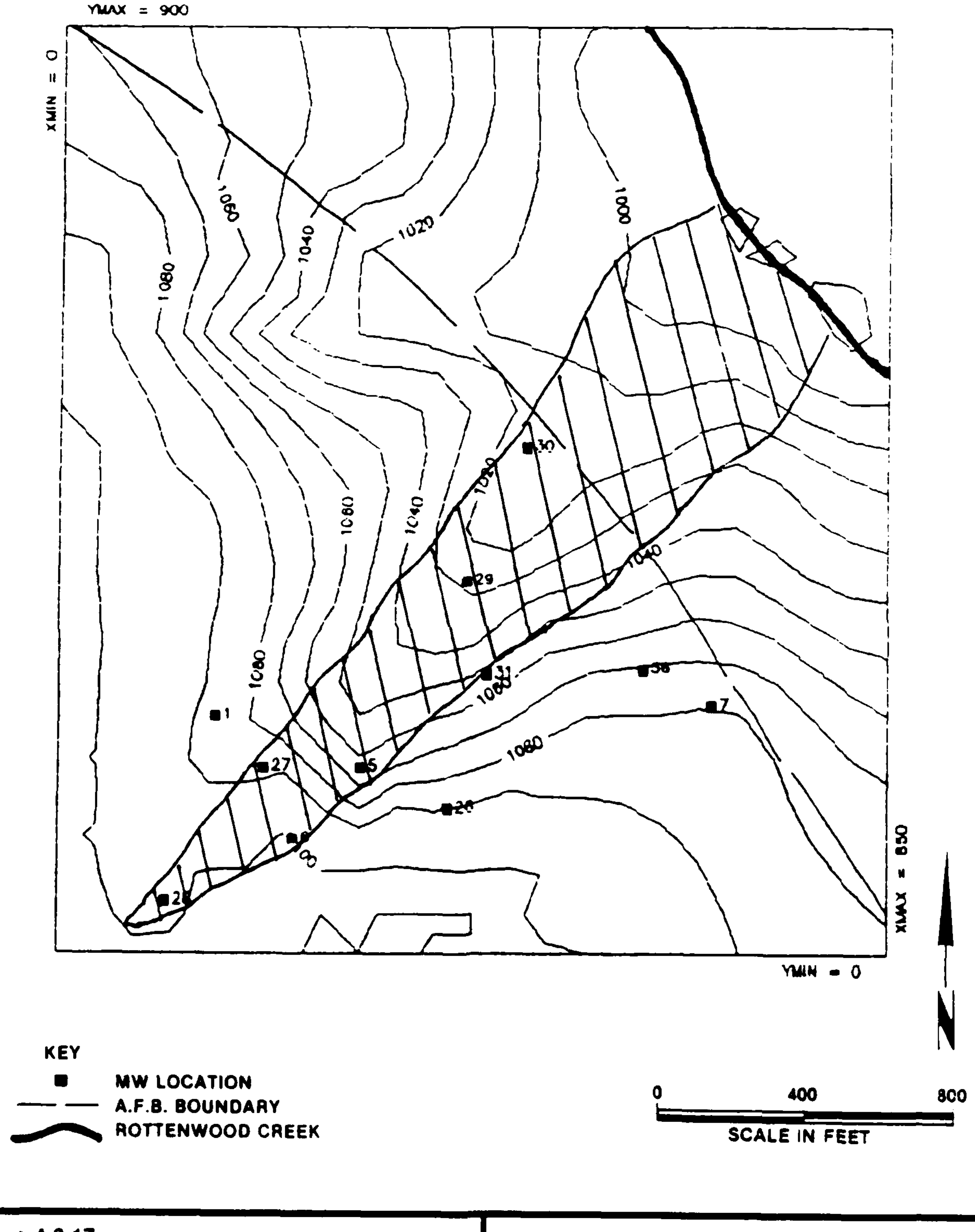

Figure 4.3-17
OFFBASE TCE PLUME—730-DAY RANDOM WALK PROJECTION FOR MARCH 1985 IMPOSED ON SURFACE ELEVATION (FT)

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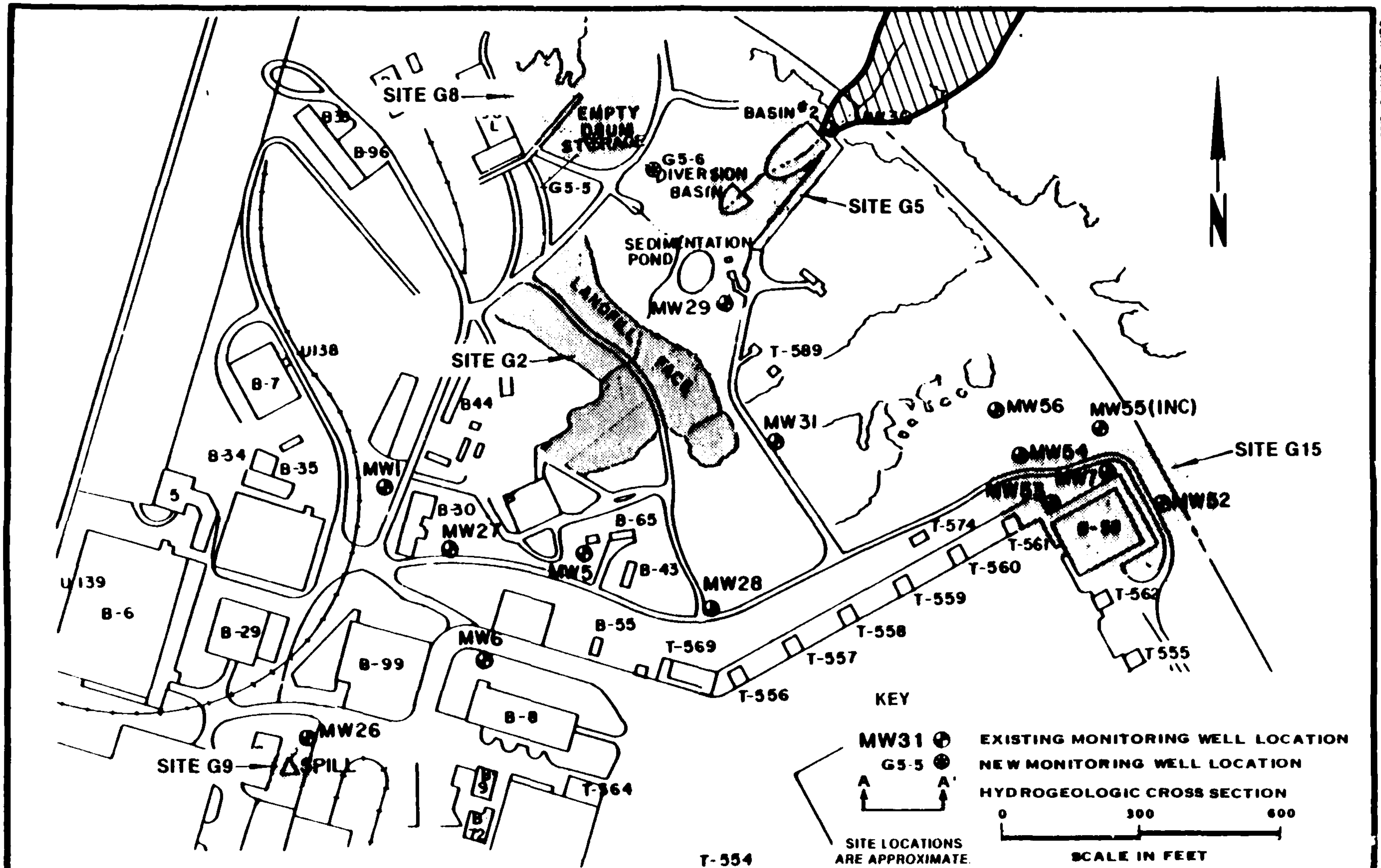

Figure 4.3-18
OFFBASE TCE CONTAMINATION PLUME—180-DAY PROJECTION FOR SEPTEMBER 1984, ZONE 2—INDUSTRIAL FACILITIES, ACTIVE LANDFILL, AND STORMWATER RETENTION BASIN NO. 2

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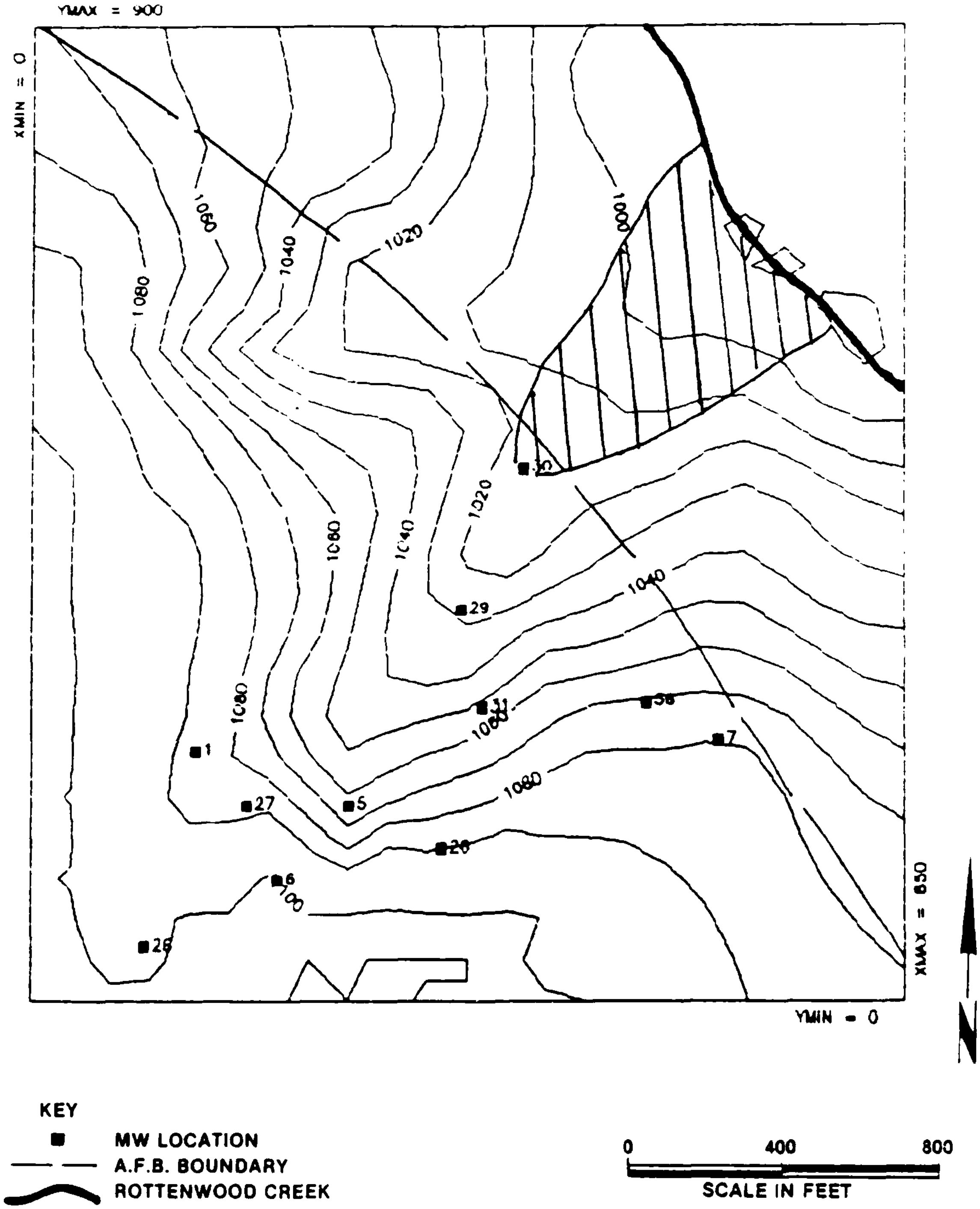

Figure 4.3-19
OFFBASE TCE PLUME—365-DAY RANDOM WALK PROJECTION FOR MARCH 1985 IMPOSED ON SURFACE ELEVATIONS (FT)

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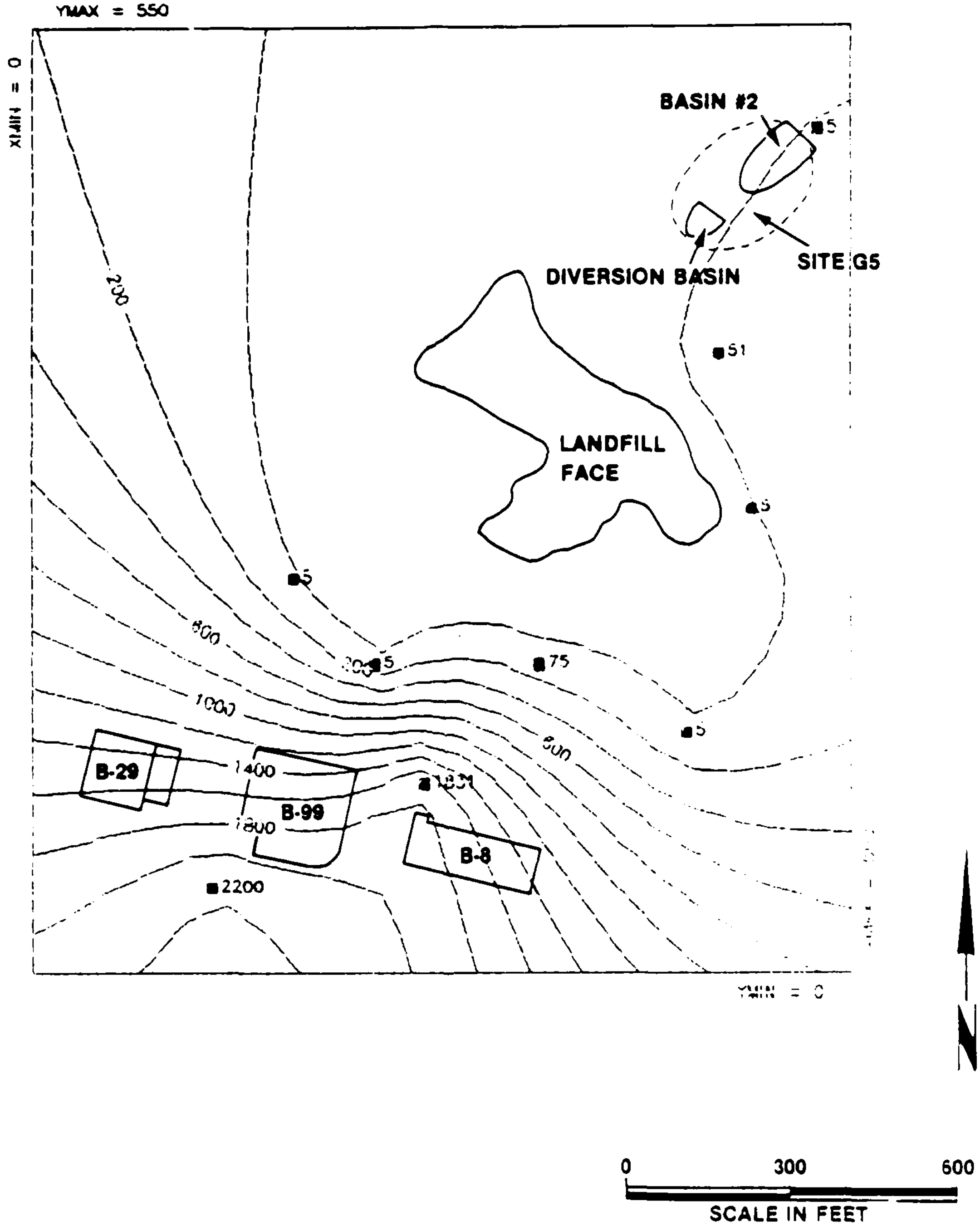

Figure 4.3-20
1,2-DICHLOROETHANE CONTAMINATION (ug/l), ZONE 2—INDUSTRIAL FACILITIES, ACTIVE LANDFILL, AND STORMWATER RETENTION BASIN NO. 2

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Although concentrations to the west and southwest of the monitoring wells are postulated not to exist, it is impossible to confirm contamination to the southwest of Monitor Well 26 because there are no wells in this area. The source of 1,2-dichloroethane contamination may exist at an unknown distance upgradient. Figs. 4.3-21 and 4.3-22 present the 90- and 455-day plume projections for May 1985 and September 1985, respectively. May 1984 concentrations were used to make these projections. Migration of the pollutant is to the northest off DAFB and into Rottenwood Creek (see Fig. 4.3-23).

Benzene--The benzene contamination source is unknown, but Fig. 4.3-24 provides a possible location based on the high concentrations in Monitor Well 27. Although the contamination plume appears to extend to all the monitor wells at low levels, actual contamination may not exist at sites displaying 5 ug/l. This is because laboratory analysis did not test for any concentration below this level. Benzene moves much slower than either TCE or 1,2-dichloroethane (see Figs. 4.3-25 and 4.3-26). Contamination is projected not to reach Rottenwood Creek until early-to mid-1986, as predicted by Random Walk.

Toluene

The toluene source is unknown but appears to be in the same location or area as benzene. Highest concentrations are also found at Monitoring Well 27 (see Fig. 4.3-27). Laboratory analysis for toluene was not measured for levels below 5 ug/l. Toluene 365- and 730-day Random Walk projections for May 1985 and May 1986 indicate that toluene moves much slower than TCE; 1,2-dichloroethane; or benzene (see Figs. 4.3-28 and 4.3-29). Figs. 4.3-29 and 4.3-30 illustrate that the toluene plume will not migrate offbase until May 1986.

Methylene Chloride

The methylene chloride contamination source is suspected to be in the area of Monitor Well 28 because of the high concentration in that area (see Fig. 4.3-31). This source is only a suspected source because no

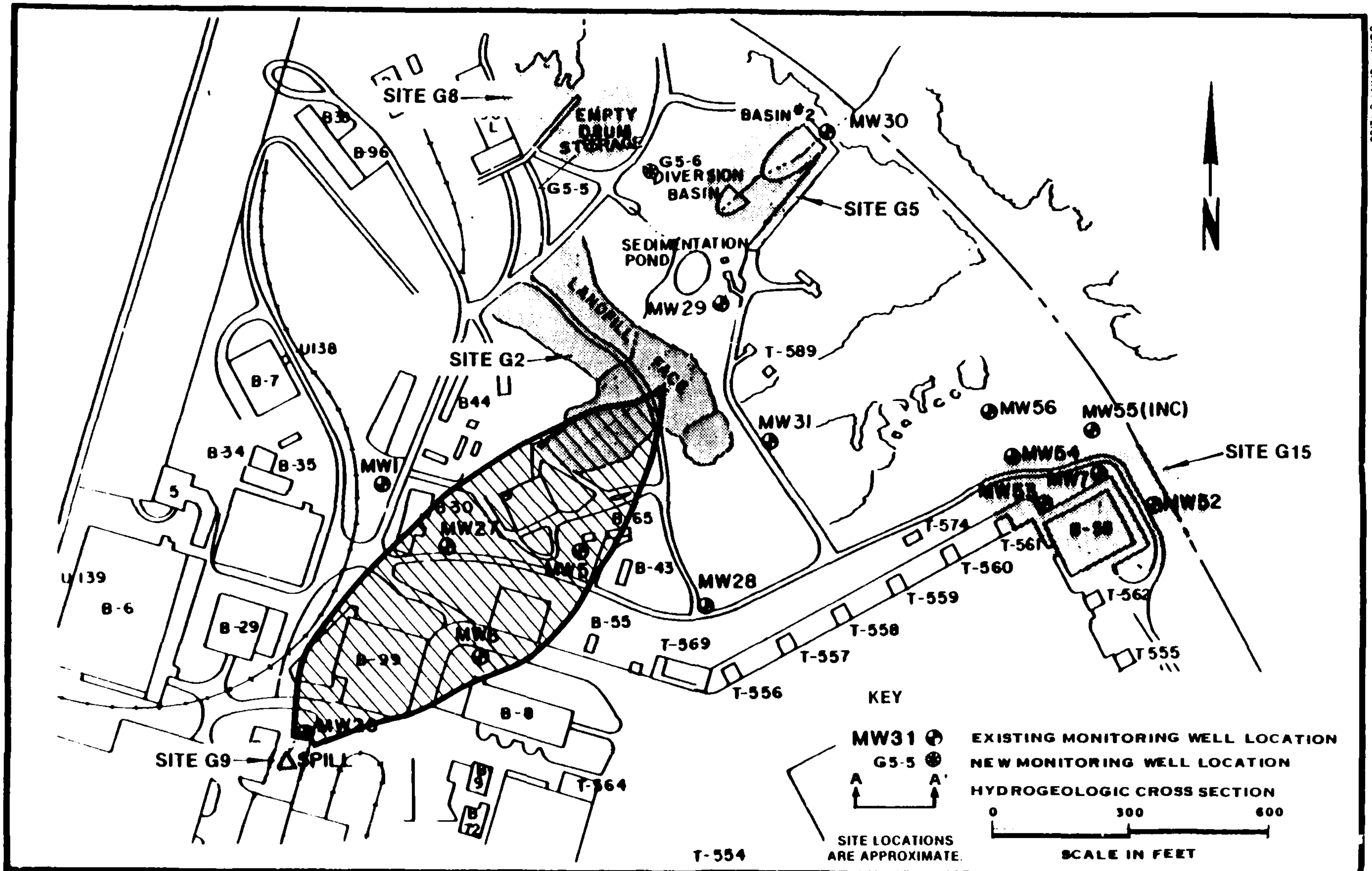

Figure 4.3-21
1,2-DICHLOROETHANE PLUME—90-DAY RANDOM WALK PROJECTION FOR MAY 1985, ZONE 2—INDUSTRIAL FACILITIES, ACTIVE LANDFILL, AND STORMWATER RETENTION BASIN NO. 2

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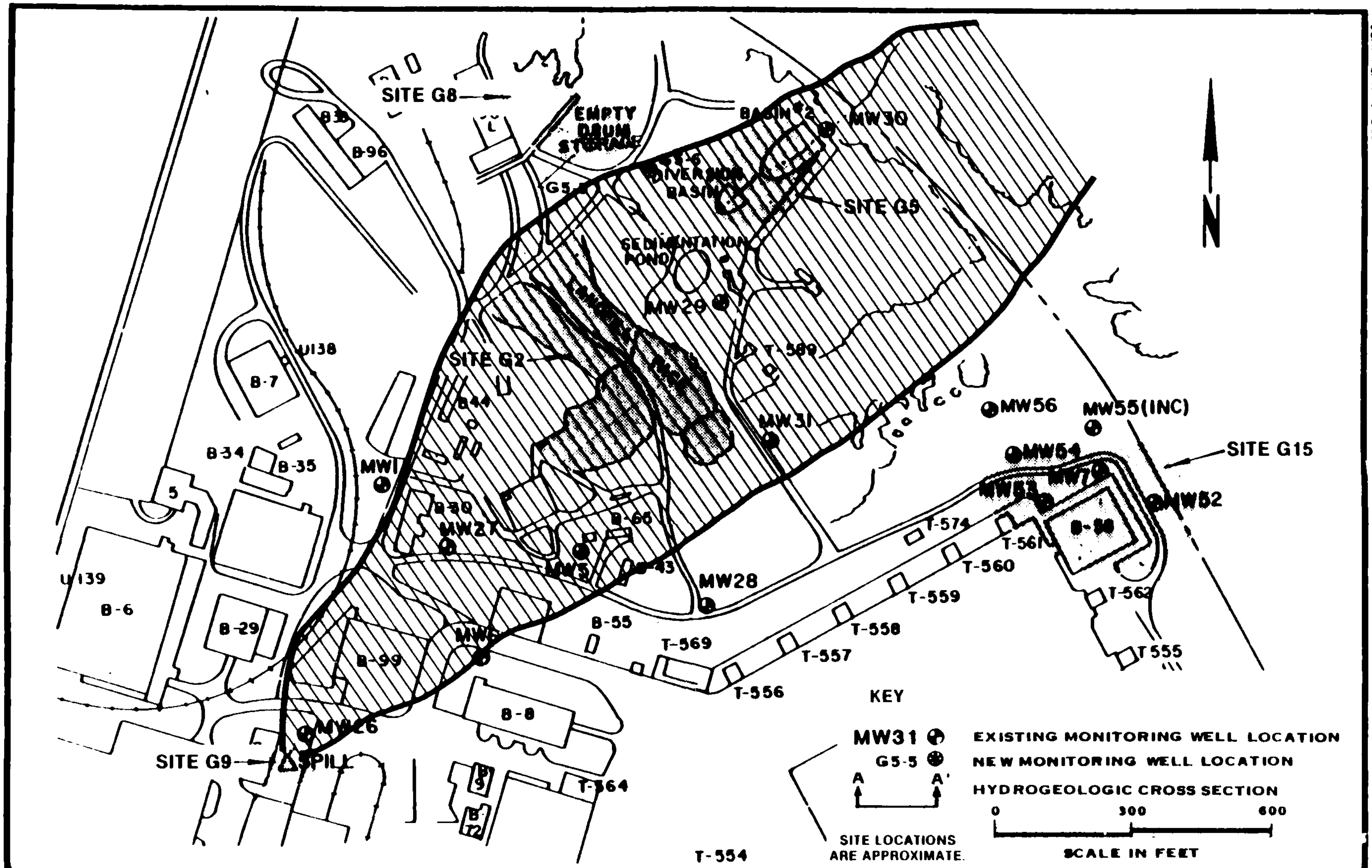

Figure 4.3-22
1,2-DICHLOROETHANE PLUME—455-DAY RANDOM WALK PROJECTION FOR SEPTEMBER 1985, ZONE 2—INDUSTRIAL FACILITIES, ACTIVE LANDFILL, AND STORMWATER RETENTION BASIN NO. 2

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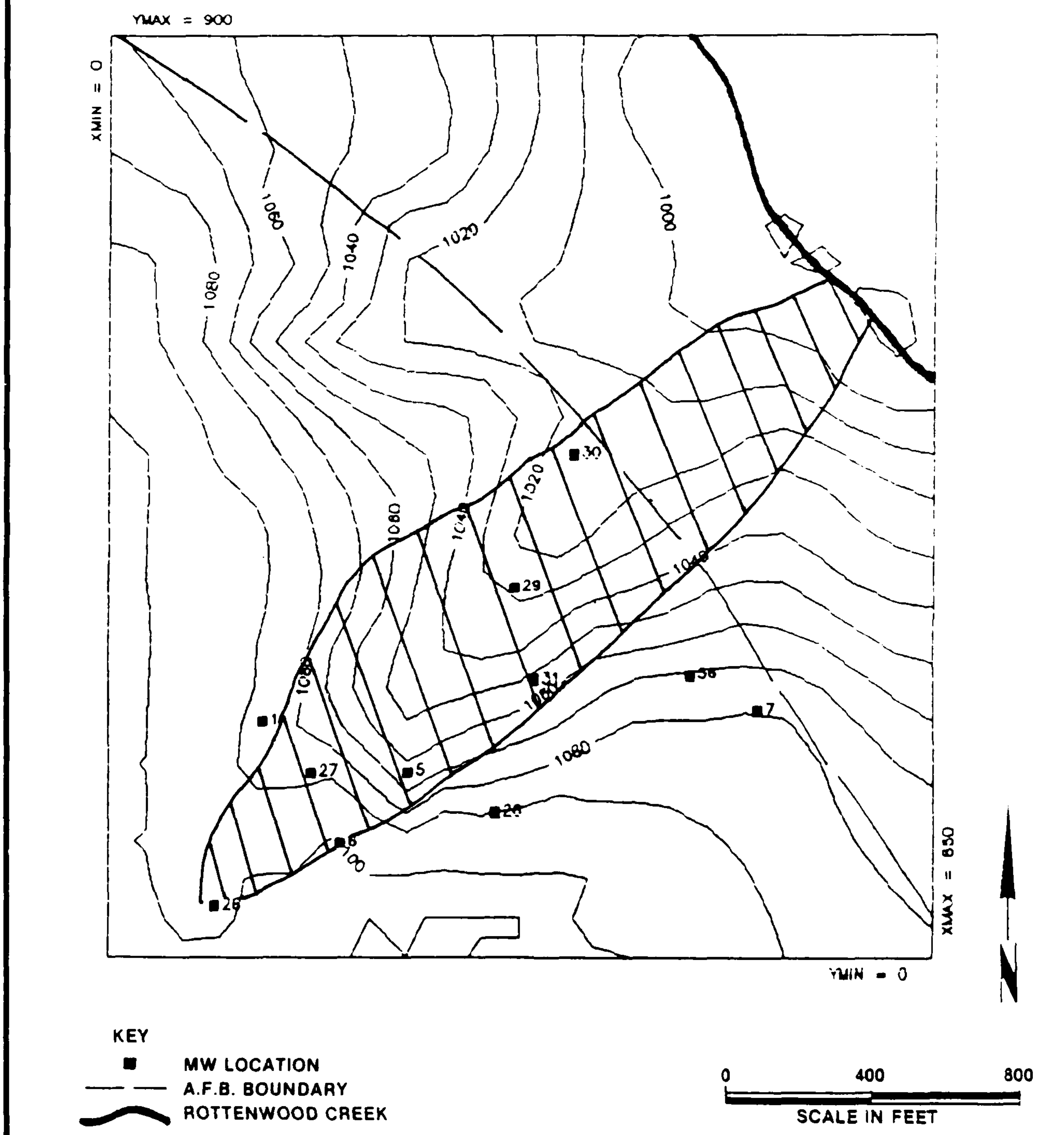

Figure 4.3-23
1,2-DICHLOROETHANE PLUME—455-DAY RANDOM WALK PROJECTION FOR SEPTEMBER 1985 IMPOSED ON SURFACE ELEVATIONS (FT)

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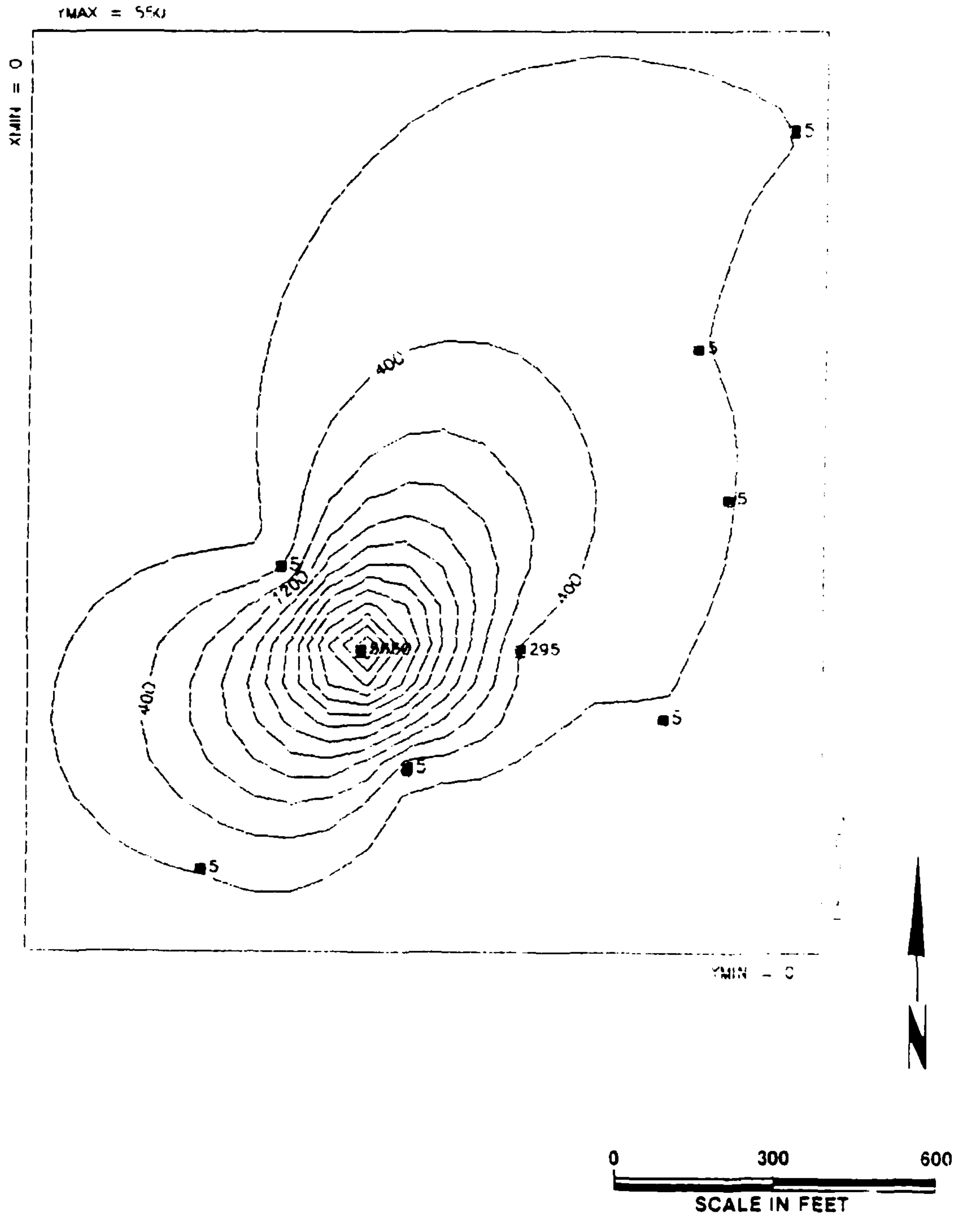

Figure 4.3-24
BENZENE CONTAMINATION (ug/l), ZONE 2—INDUSTRIAL FACILITIES, ACTIVE LANDFILL, AND STORMWATER RETENTION BASIN NO. 2

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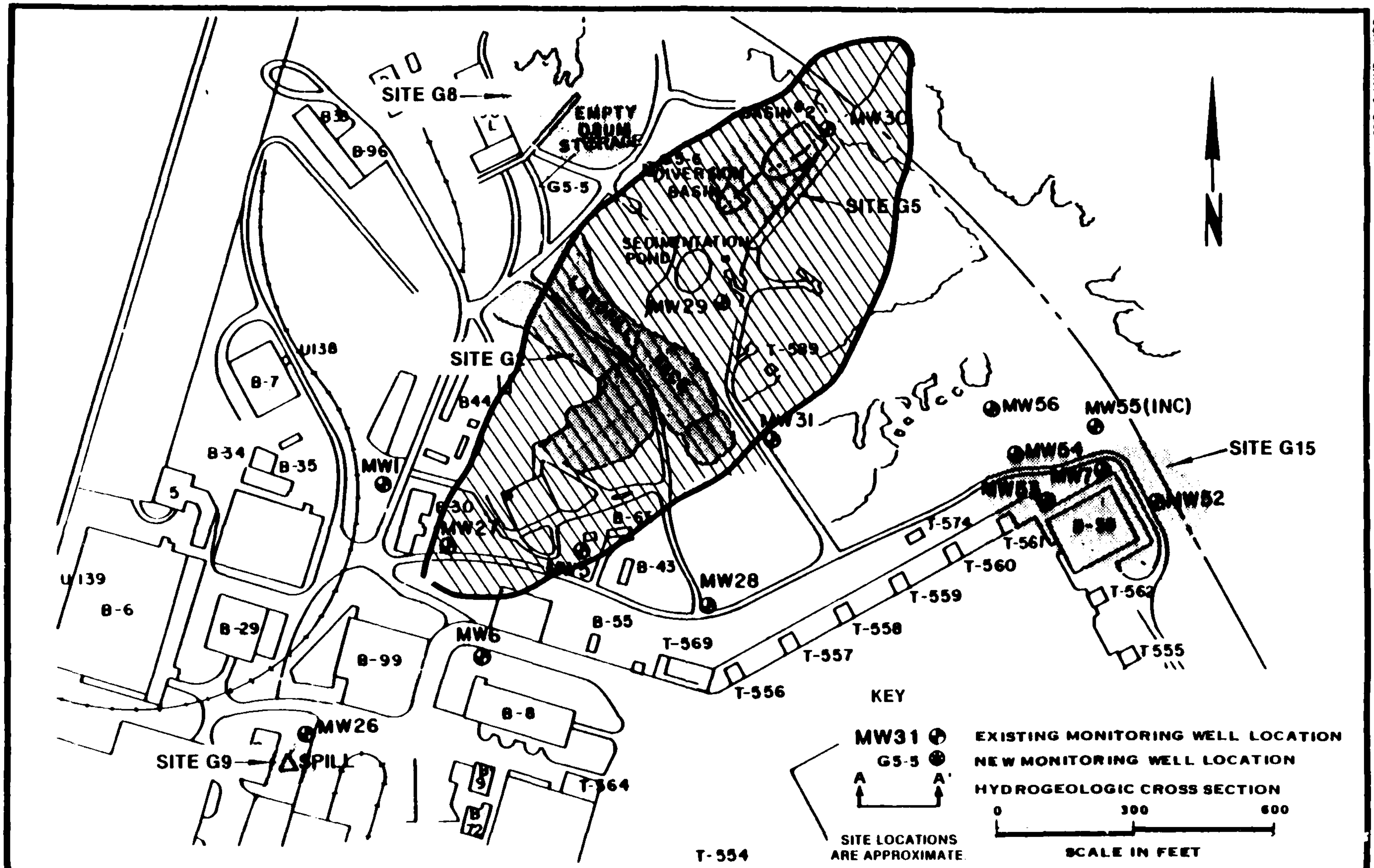

Figure 4.3-25
BENZENE PLUME—365-DAY RANDOM WALK PROJECTION FOR MAY 1985, ZONE 2—INDUSTRIAL FACILITIES, ACTIVE LANDFILL, AND STORMWATER RETENTION BASIN NO. 2

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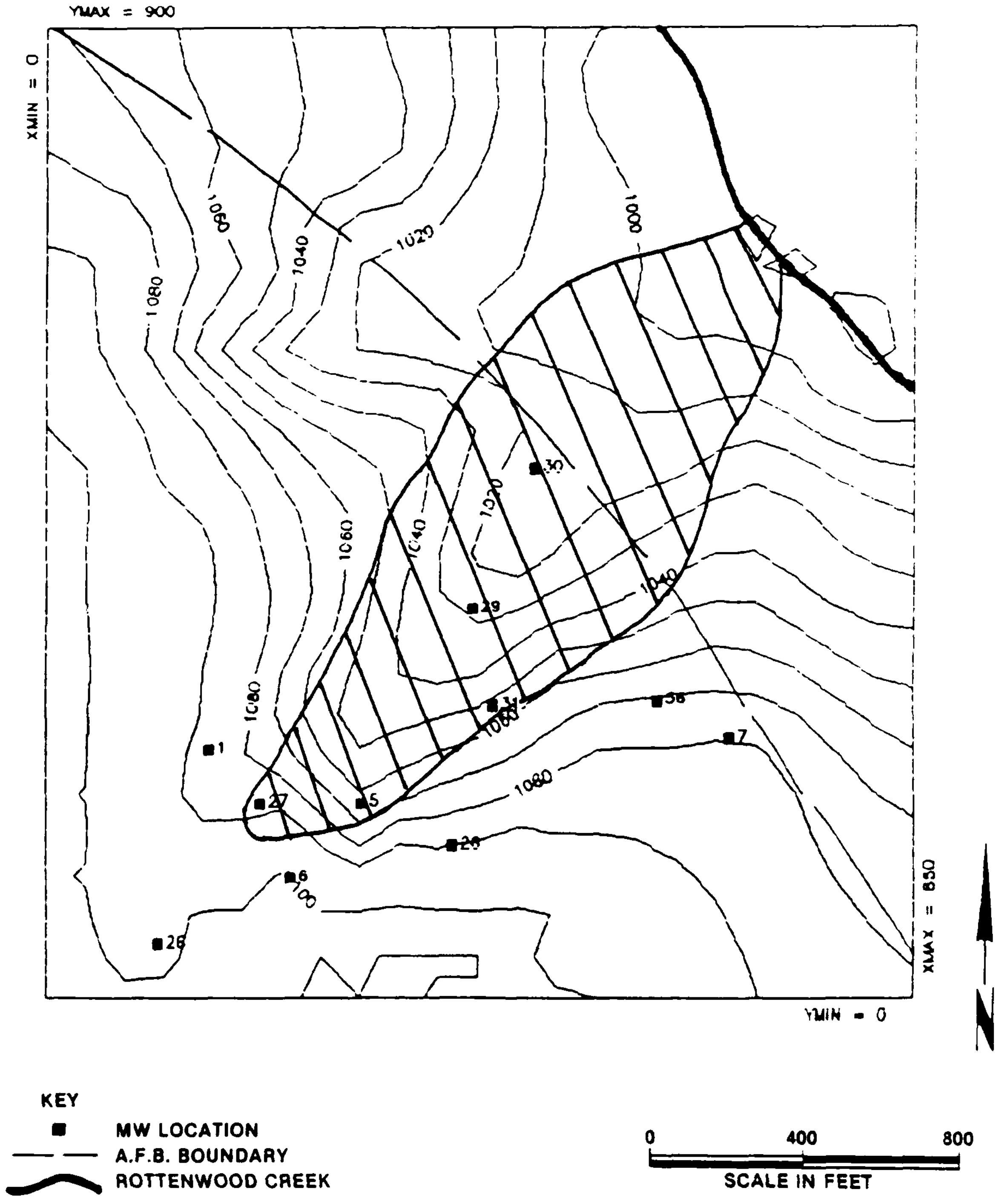

Figure 4.3-26
BENZENE PLUME—730-DAY RANDOM WALK PROJECTION FOR MAY 1986 IMPOSED ON SURFACE CONTOURS (FT)

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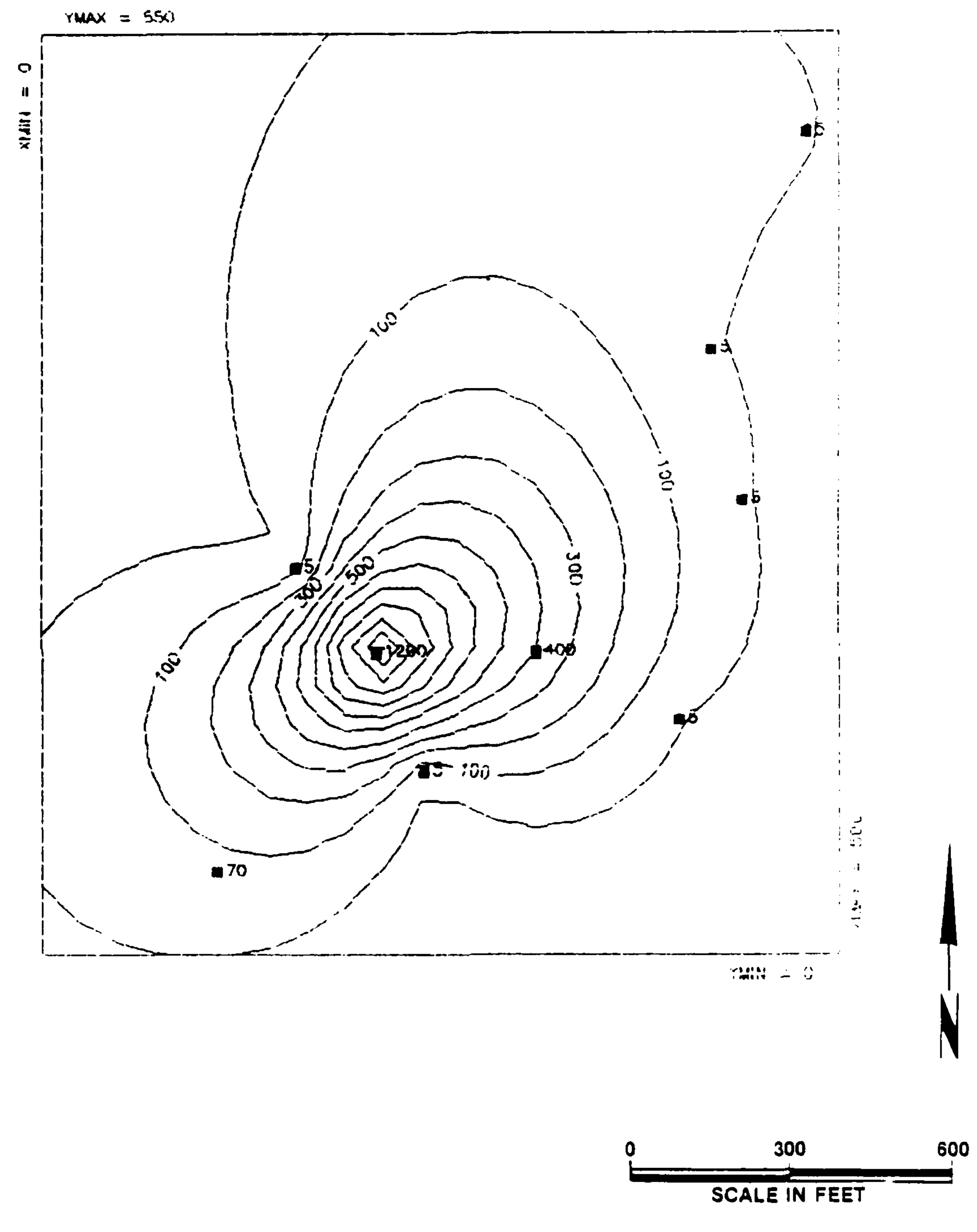

Figure 4.3-27
TOLUENE CONTAMINATION (ug/l), ZONE 2—INDUSTRIAL FACILITIES, ACTIVE LANDFILL, AND STORMWATER RETENTION BASIN NO. 2

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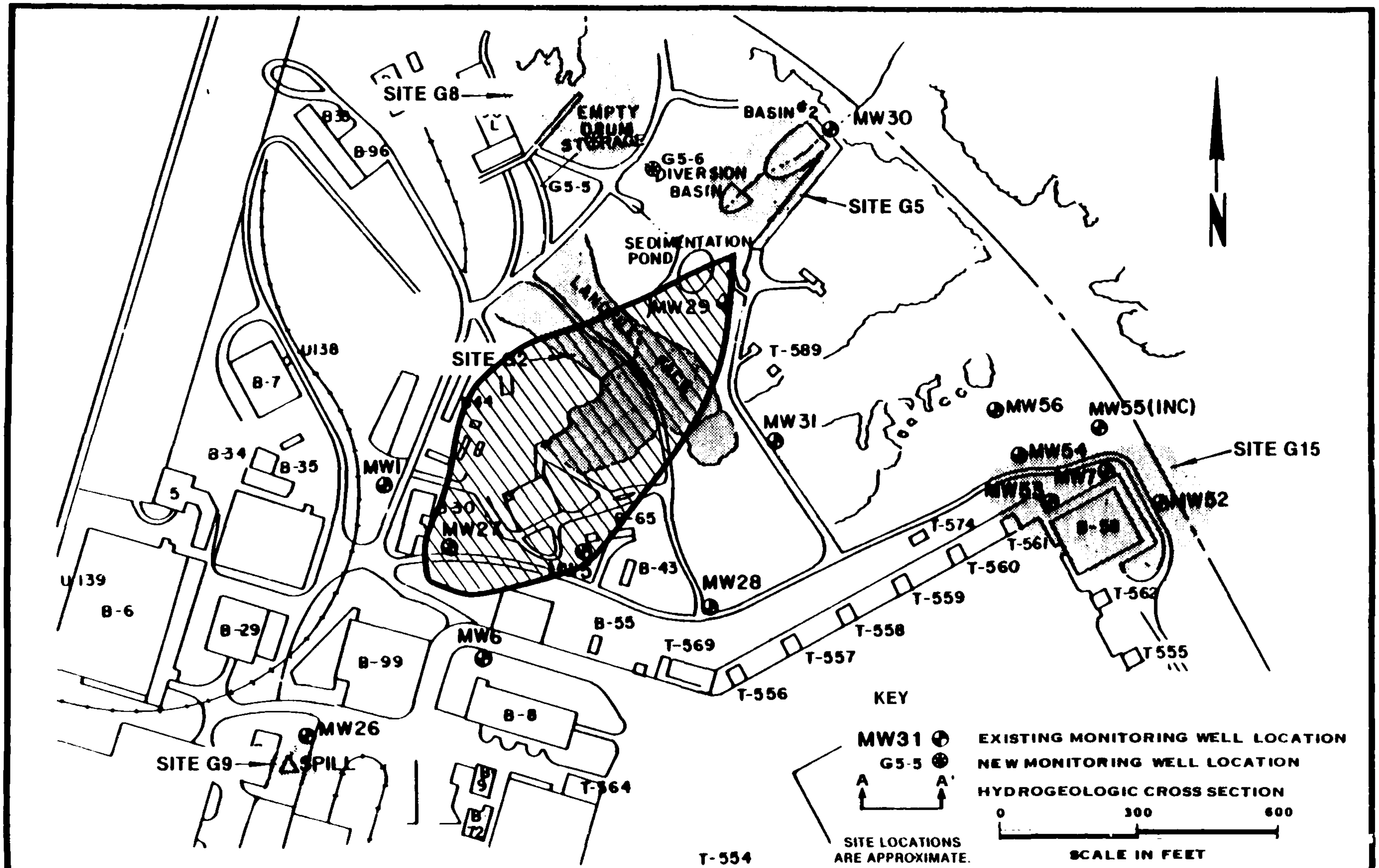

Figure 4.3-28
TOLUENE PLUME—365-DAY RANDOM WALK PROJECTION FOR MAY 1985, ZONE 2—INDUSTRIAL FACILITIES, ACTIVE LANDFILL, AND STORMWATER RETENTION BASIN NO. 2

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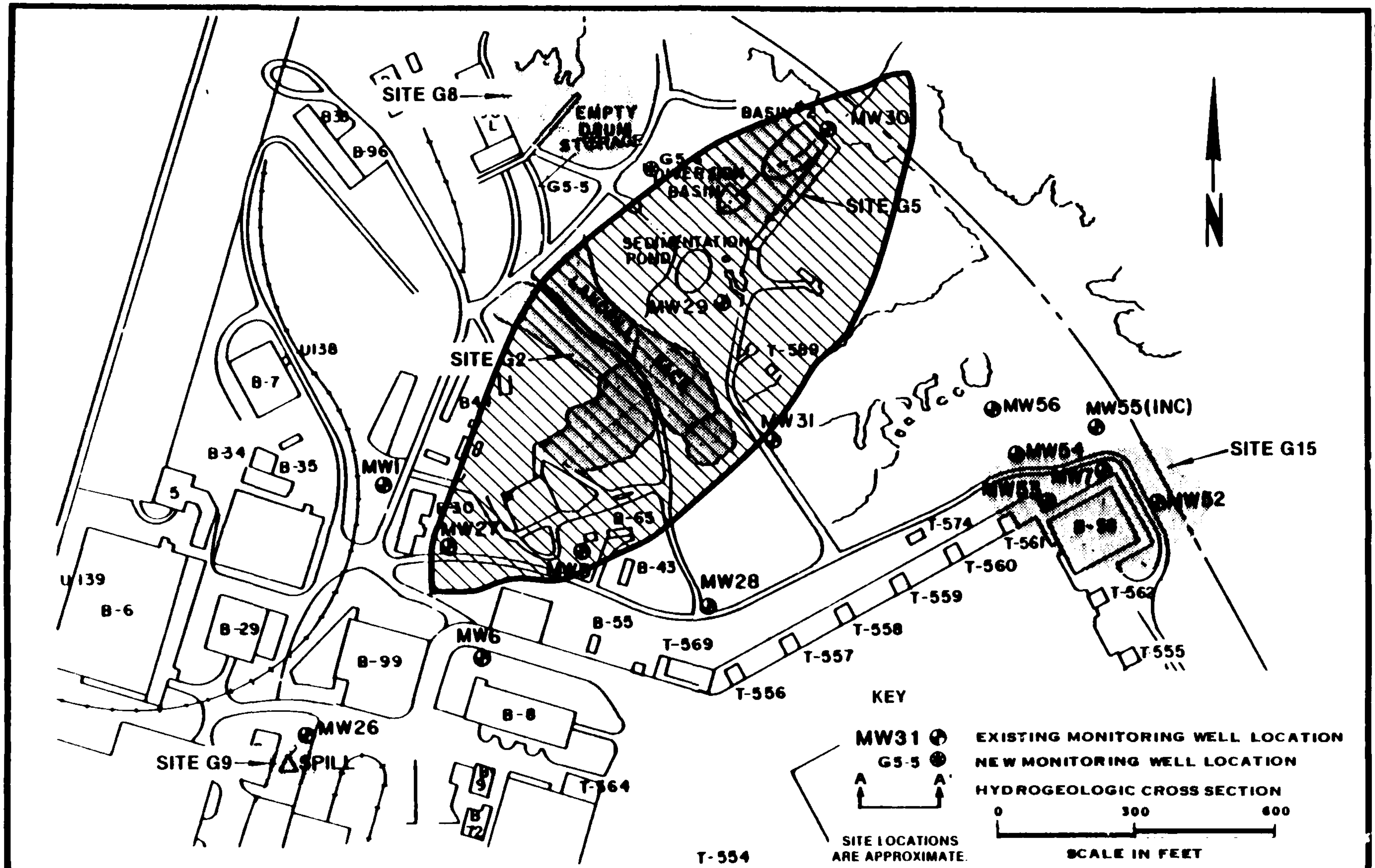

Figure 4.3-29
TOLUENE PLUME—730-DAY RANDOM WALK PROJECTION FOR MAY 1986, ZONE 2—INDUSTRIAL FACILITIES, ACTIVE LANDFILL, AND STORMWATER RETENTION BASIN NO. 2

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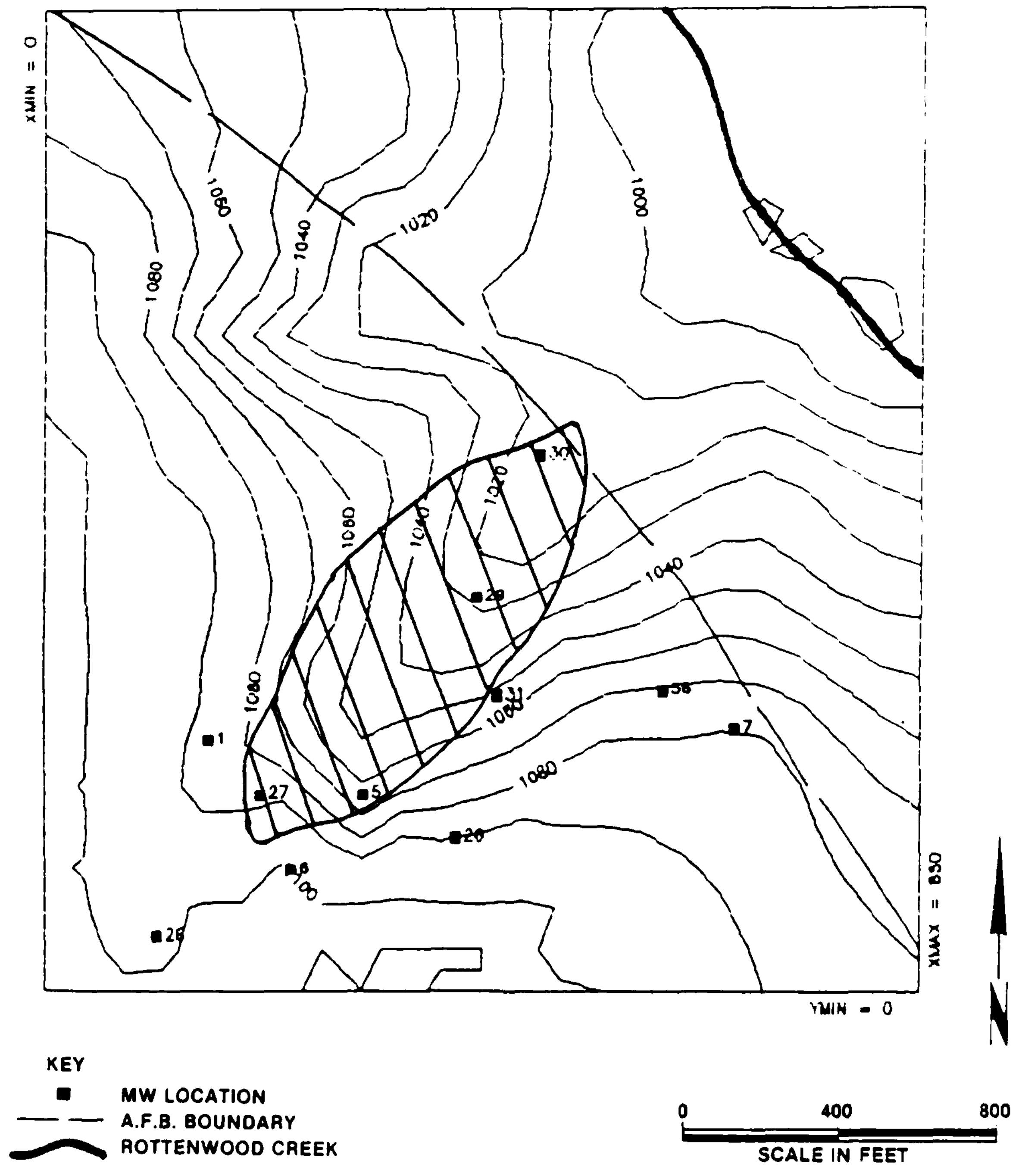

Figure 4.3-30
TOLUENE PLUME—730-DAY RANDOM WALK PROJECTION FOR MAY 1986 IMPOSED ON SURFACE CONTOURS (FT)

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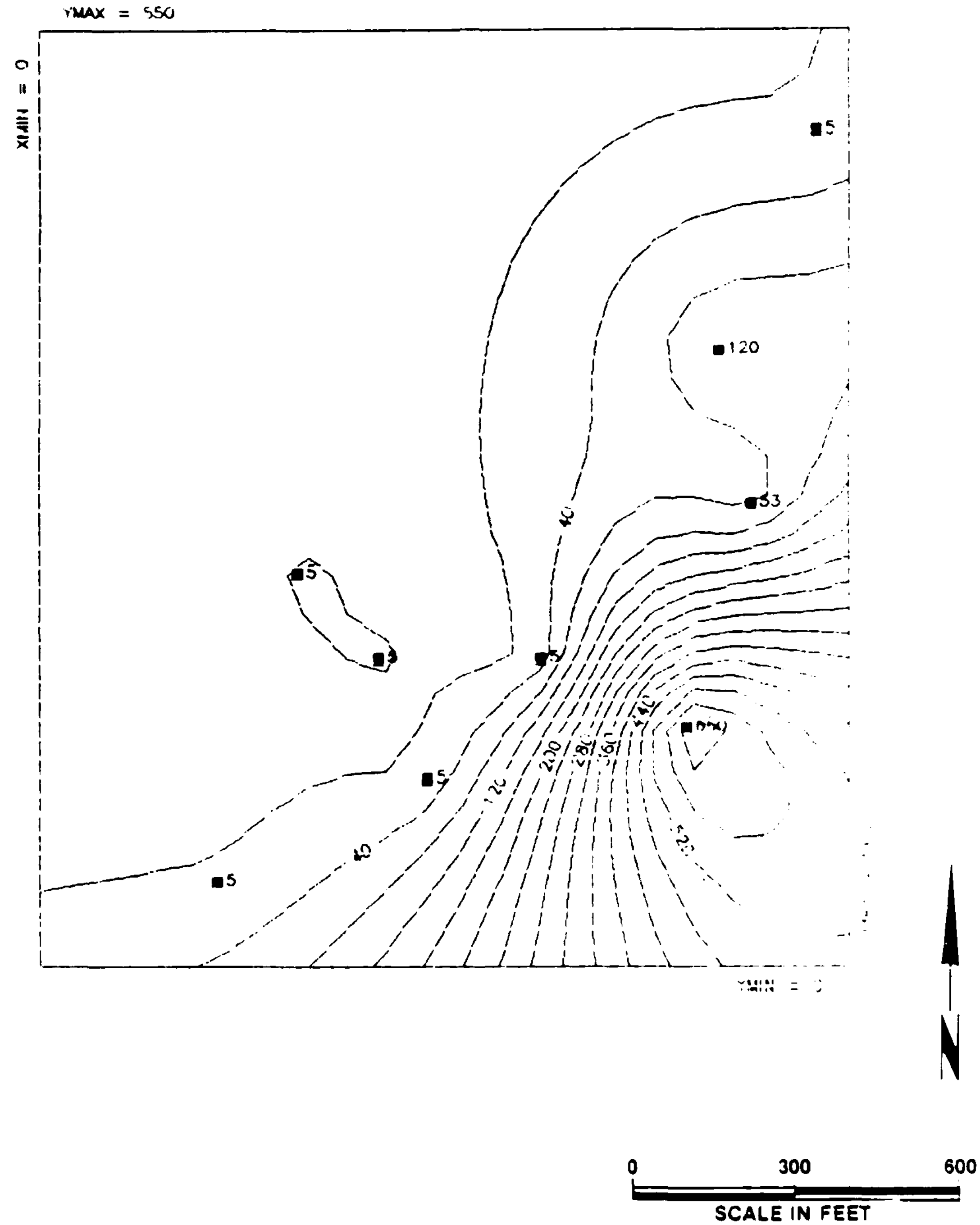

Figure 4.3-31
METHYLENE CHLORIDE CONTAMINATION (ug/l), ZONE 2—INDUSTRIAL FACILITIES, ACTIVE LANDFILL, AND STORMWATER RETENTION BASIN NO. 2

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monitor wells are upgradient from Monitor Well 28. Figs. 4.3-32 and 4.3-33, the 365- and 730-day Random Walk plume projections, indicate methylene chloride is moving off DAFB. Projections indicate the pollutant will be off DAFB by May 1985 and into Rottenwood Creek by late 1985. Fig. 4.3-34 shows the contamination plume clearly contaminating Rottenwood Creek as it travels a north-northwest course.

CONCLUSIONS

The Random Walk-Plasm model is a useful tool for predicting contamination migration when adequate ground water parameters are acquired. The model's accuracy is dependent on fairly well-defined contamination plumes or documented pollutant sources.

In modeling Zone 2, difficulties were encountered because:

1. Contamination plumes were not well-defined because of a lack of monitor wells in critical locations;
2. Inadequate number of sampling events resulting in a lack of time series contamination concentrations;
3. Cross contamination of the same pollutants from other unknown sources; and
4. A complicated, poorly understood ground water system.

Suggestions for the installation of additional monitor wells, collection and establishment of a database for ground water parameters, regular onsite and offsite contamination sampling, and the formation of a multipollutant database have been made.

The Random Walk model has predicted that four of the five pollutants modeled have extended off DAFB and three have entered Rottenwood Creek. Contamination by the five pollutants is projected for Rottenwood Park and the area designated as a special park for handicapped citizens. Continued contamination could result in exposure to park visitors and nearby residents.

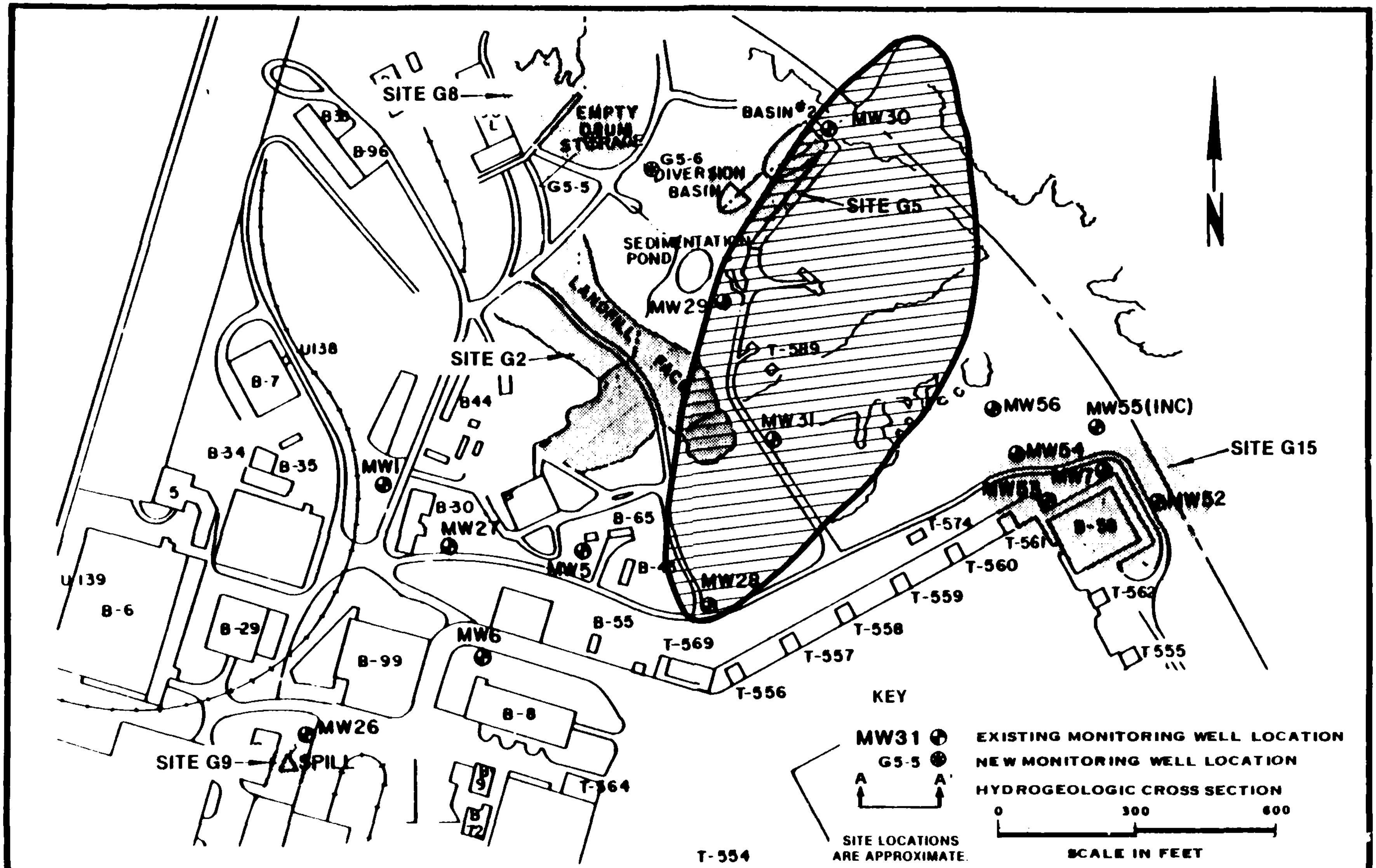

Figure 4.3-32
METHYLENE CHLORIDE PLUME—365-DAY RANDOM WALK PROJECTION FOR MARCH 1985, ZONE 2—INDUSTRIAL FACILITIES, ACTIVE LANDFILL, AND STORMWATER RETENTION BASIN NO. 2

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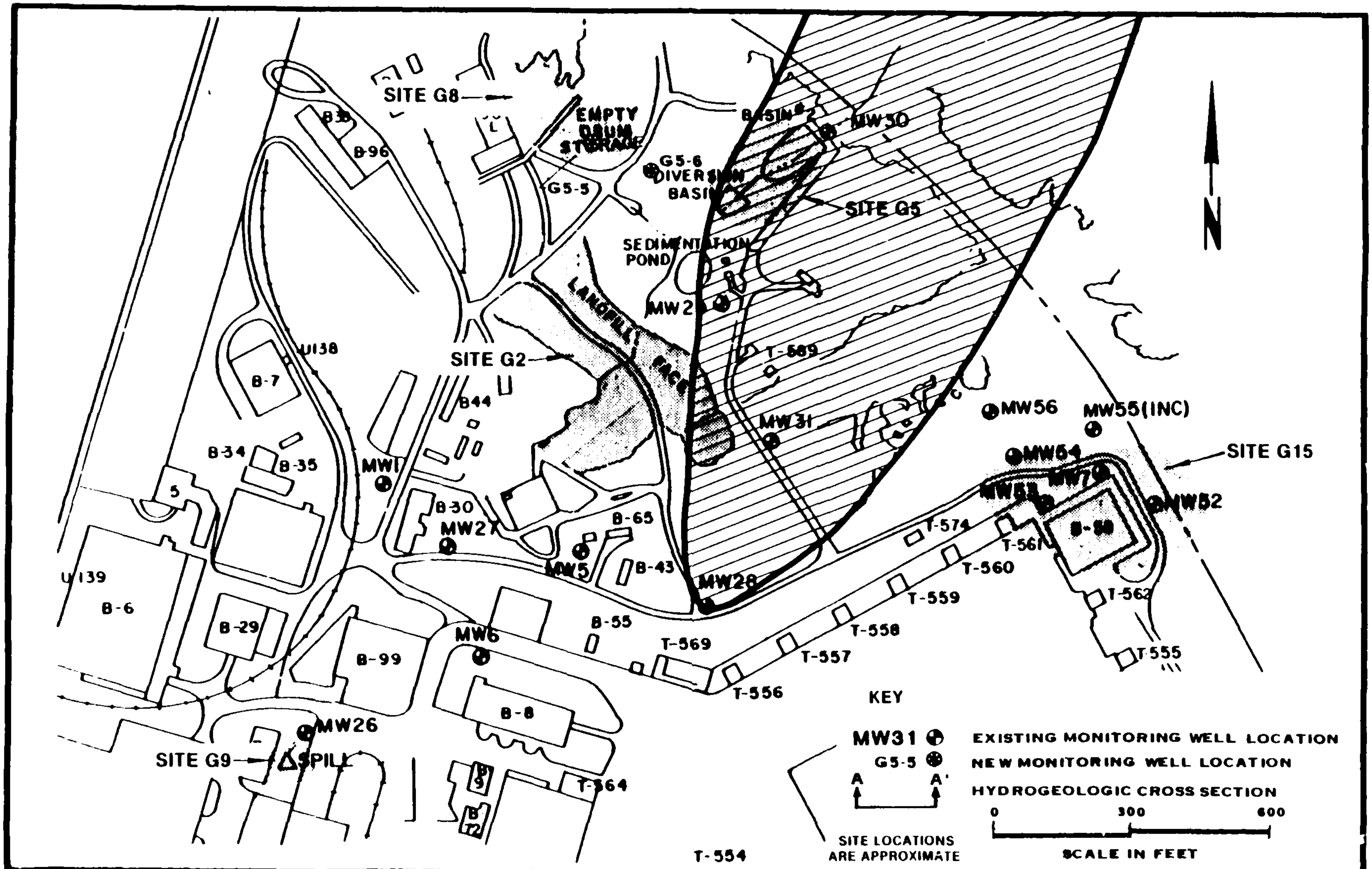

Figure 4.3-33
METHYLENE CHLORIDE PLUME—730-DAY RANDOM WALK PROJECTION FOR MAY 1986, ZONE 2—INDUSTRIAL FACILITIES, ACTIVE LANDFILL, AND STORMWATER RETENTION BASIN NO. 2

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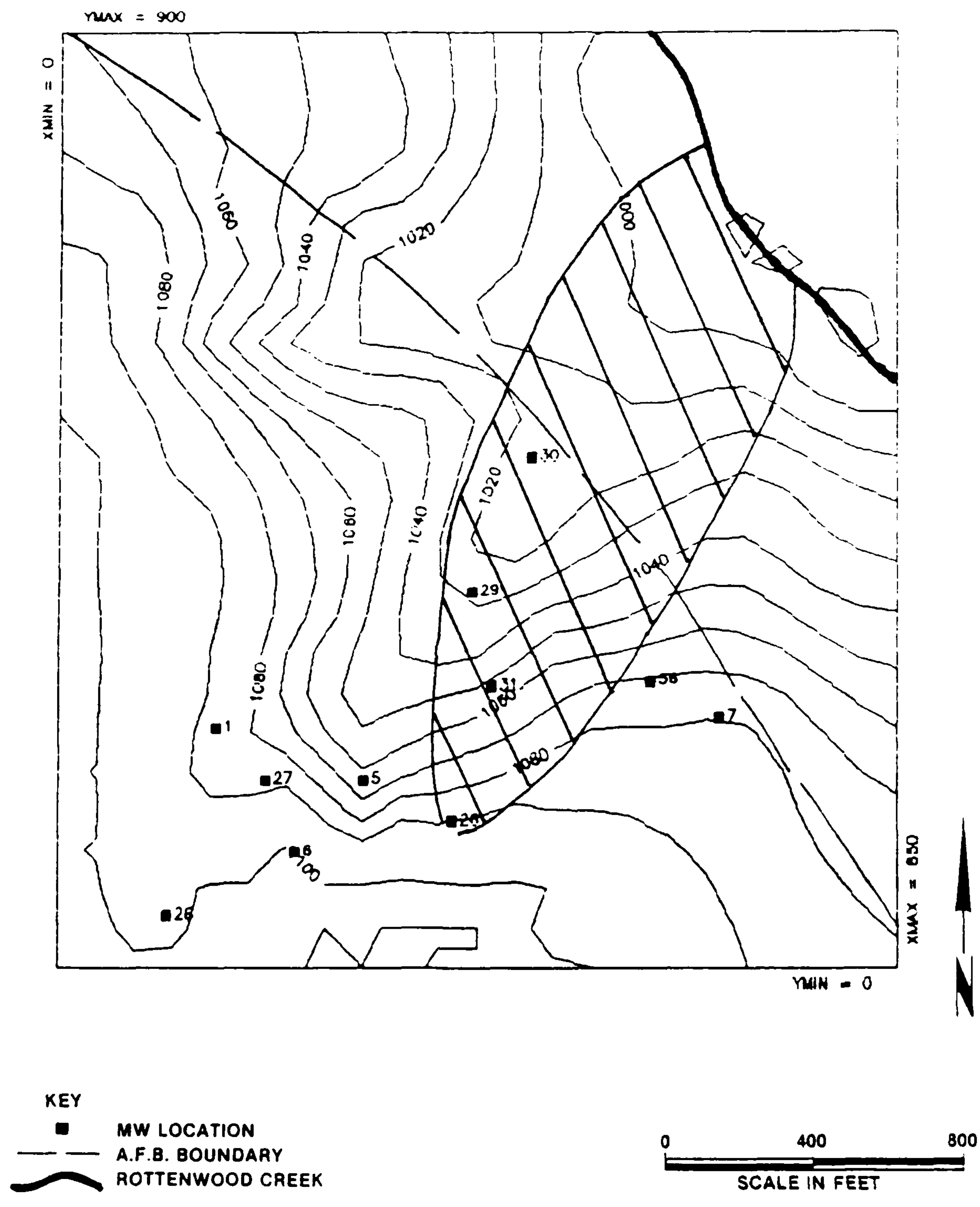

Figure 4.3-34
METHYLENE CHLORIDE PLUME—730-DAY RANDOM WALK PROJECTION FOR MAY 1986 IMPOSED ON SURFACE ELEVATIONS (FT), ZONE 2—INDUSTRIAL FACILITIES, ACTIVE LANDFILL, AND STORMWATER RETENTION BASIN NO. 2

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5.0 ALTERNATIVE MEASURES

Three categories are possible for the sites investigated:

1. Take no further action;
2. Conduct further monitoring to determine the need, if any, of cleanup; or
3. Undertake corrective actions to mitigate any contamination.

Category 1 (No Further Action) is appropriate for sites where there is little, if any, evidence to indicate that the site is a source of significant contamination. However, reasonable judgments must be made so that resources can be allocated to sites that have the highest potential for environmental or human-health problems.

Category 2 (Additional Monitoring) is appropriate where insufficient evidence exists to place a site in either Category 1 or 3. This category should be utilized with care since there is some risk that delay could allow contamination to spread and worsen the problem. The goal should be to gather enough evidence in a timely manner to resolve the question of whether or not the site should be cleaned up.

Category 3 (Mitigation) is appropriate where there is clear indication that current or future human or environmental problems will exist. The priority for actions would depend on the magnitude of the threat and whether that threat was current or future. Mitigative actions may include (but are not limited to) removal, containment, treatment, or stabilization of the contamination.

Category 1 (No Further Action) is judged to be the appropriate action for the following IRP Phase II, Stage 1 site:

1. Site G11 (JP-5 Fuel Spill No. 1) located in the C-5 Flightlin Area.

The three criteria listed previously were used to decide whether a site would be recommended for additional analyses or for no further action. In this study, a site was classified for no further action if this area has or will be encompassed in a monitoring program for a nearby site.

Category 2 (Additional Monitoring) is judged to be the appropriate alternative for the following 12 IRP Phase II, Stage 1 sites.

1. Site G2 (Active Landfill) located in the Industrial Facilities, Active Landfill, and Stormwater Retention Basin No. 2 area;
2. Site G3 (Past Landfill) located in the Industrial Waste Land Disposal Area;
3. Site G4 (Sanitary WWTP Sludge Disposal Area) located in the Industrial Waste Land Disposal Area;
4. Site G5 (Stormwater Retention Basin No. 2) located in the Industrial Facilities, Active Landfill, and Stormwater Retention Basin No. 2 area;
5. Site G9 (TCE Spill at B-76) located in the Industrial Facilities, Active Landfill, and Stormwater Retention Basin No. 2 area;
6. Site G13 (Position 58--Fuel/Defuel Station) located in the C-5 Flightline Area;
7. Site G14 (Position 19--Fuel/Defuel Station) also located in the C-5 Flightline Area;
8. Site G15 (B-58 Wing Tank Seal Test Facility);
9. Site G16 (B-104 Gas Pump Station) located in the C-5 Flightline Area;
10. Site G8 (Bldg. B-96 Complex) located in the Industrial Facilities, Active Landfill, and Stormwater Retention Basin No. 2 area;
11. Site G10 (JP-5 Fuel Spill No. 2) located in the truck fuel farm in the Industrial Waste Treatment Facility; and
12. Site G12 (Position 71--Sodium Dichromate Spill) located in the C-5 Flightline Area.

Criteria for recommending additional analyses for these sites are listed below:

1. Results reported for one or more screening or specific parameters at one or more sampling locations within the site are positive and indicate contamination exists at the site;
2. Existing information, particularly the Phase I report and reports produced by contractors to Lockheed-Georgia Co., indicates that the contaminants of concern have been disposed of or spilled within the site; and
3. Available data for the site are insufficient to proceed to Alternative 1 (Mitigation) or Alternative 3 (No Further Action) (i.e., Ground Water Quality Assessment Plan is required).

Category 3 (Mitigation) is a necessary alternative for three Phase II, Stage 1 IRP sites at Air Force Plant 6. These sites are as follows:

1. Site G1 (Surface Impoundment) located in the Industrial Waste Land Disposal zone (RCRA closure),
2. Site G6 (B-10 Aeration Basin) located in the Industrial Waste Treatment Facility zone (RCRA closure), and
3. Site G7 (Position 65--C-5 Wash Rack Ponds) located in the C-5 Flightline Zone (RCRA closure).

Criteria for recommending mitigation for these sites are listed below:

1. Existing data and analytical results from assessment studies indicate the presence of hazardous substances at the site of such types and in such quantities that pose a serious threat to public health, welfare, and the environment;
2. Sufficient evidence exists to support a significant potential for release and migration of hazardous substances through environmental pathways; and
3. Evidence that the site is a RCRA-regulated hazardous waste disposal unit and must meet the new design criteria and monitoring requirements for closure or an operating facility.

6.0 CONCLUSIONS AND RECOMMENDATIONS

6.1 GENERAL CONCLUSIONS

Water quality management at Air Force Plant 6 must be approached in a systematic and coordinated program that will meet the objectives of the USAF IRP, RCRA Monitoring and Closure Regulations for Hazardous Waste Units, and RCRA Underground Storage Tank (UST) Monitoring Regulations for Air Force Plant 6 and Dobbins AFB. ESE believes that the type and extent of contamination at both these bases is sufficiently complex and interactive that a strategy should be implemented that would result in the adoption of a Master Plan for coordinating and tracking the activities of Air Force Plant 6, Dobbins AFB, and Lockheed-Georgia Co. to investigate and mitigate contamination incidents.

ESE has prepared this report based on analysis of more than 10 reports that have presented extensive geohydrological testing and laboratory data conducted by Law, Chester Engineers, and Wilson and Co.

The diversity of data sources requires that a comprehensive Data Base Management System be established for compiling and evaluating environmental data at Air Force Plant 6 and Dobbins AFB.

6.2 RECOMMENDATIONS

This section presents recommendations for Phase II, Stage 2 work at Air Force Plant 6 on a site-by-site basis in the designated areas. One or a combination of the following evaluation criteria was used in the selection of recommended Phase II, Stage 2 actions:

1. Existence of data indicating contamination of environmental media by toxic and/or hazardous materials;
2. Evidence of migration or strong potential for migration of contamination beyond site boundaries;
3. Existence of a migration pathway which would allow contaminants to adversely impact human populations; and

4. Documented violation or potential for violation of applicable federal, state, or local environmental regulations.

Much evidence of ground-water and surface-water contamination at Air Force Plant 6 is based on general screening analyses and a priority pollutant volatile scan. A conservative approach requires that positive screening results be investigated with expanded sets of specific analyses. The emphasis of this expanded set of analyses would be directed toward compounds associated with gasoline, jet fuel, organic solvents, and PCBs. EPA Methods 601/602 analytes (the purgeable halocarbons, aliphatics, and aromatic compounds) should be included in analyses.

PCBs have not been sampled previously in soils, sediments, sludges, surface waters, or monitoring wells on Air Force Plant 6.

An environmental audit conducted by JRB Associates identified several potential areas at Air Force Plant 6 where PCB materials have been handled. Transformers containing oil with PCB concentrations greater than 500 ppm have been collected in the past and were stored in Bldg. T-666 and possibly others. According to CH2M Hill, drums of rags and equipment contaminated with PCBs also were generated. Other transformers containing PCB-contaminated oil are reportedly in service. No reports or evidence documenting PCB spills have been reviewed by ESE; however, PCB spills and contamination may have occurred because PCBs were used extensively onsite in electrical equipment. Low PCB concentrations ranging from <1 to 8 ppm have been detected in the sediments of Big Lake on Dobbins AFB. Because Big Lake has historically received significant inflow of contamination from Air Force Plant 6, it would be prudent to sample ground water from several strategically located wells for PCBs in plant areas where PCB transformers were known to have been installed, stored, or repaired.

Several sampling techniques can be used to collect volatile organic compounds in the field. These samples may then be analyzed with an HNU or gas chromatograph in the field or in the laboratory by Gas Chromatography/Mass Spectroscopy, if appropriate. Field techniques can quickly indicate areas of high concentrations and can be used to design a detailed sampling plan.

Soil gas sampling and organic vapor analysis (OVA) can be economical tools in determining the horizontal and vertical extent of subsurface volatile organic contamination at several sites at Air Force Plant 6. Soil gas monitoring can be implemented by using an HNU/OVA meter and measuring volatile organic vapors from soils using a simple headspace technique. The technique can be used during drilling operations to obtain samples at various depths or during surficial soil sampling. A more sophisticated analysis can be conducted by driving probes into the soils to various depths and applying a vacuum to draw soil pore vapors to the surface. These vapors are then analyzed in the field with a gas chromatograph using an appropriate detection method depending on the required detection limits and the type of compounds under investigation.

6.2.1 INDUSTRIAL WASTE LAND DISPOSAL AREA (SITES G1, G3, AND G4) (ZONE 1)

The type and extent of contamination in this area has been confirmed to be caused by Sites G1 (Surface Impoundment) and G3 (Past Landfill). Three or four additional suspected sources exist in the area. Existing data are insufficient to define the effects on potential receptors and the relative contributions of the individual sources. The design and implementation of a cost-effective remedial action plan is dependent on the identification of the relative contributions of individual sources. In addition, Lockheed-Georgia Co. is proceeding with work to close the Surface Impoundment in cooperation with Georgia EPD. It is recommended that a Remedial Action Master Plan be developed for this area to coordinate the planned investigations.

Specifically, ESE recommends the development of a detailed ground-water and surface-water quality assessment plan to incorporate existing data and to obtain additional data needed to identify and define migration pathways, receptors, sources of contamination, and fate and effects of pollutants migrating from Air Force Plant 6 to Dobbins AFB and offsite. The initial step would be to compile and analyze all available data to determine data deficiencies using data base management software and to design a comprehensive field investigation that will confirm the type and extent of contamination and identify sources.

Several field investigations should be considered, including the following:

1. Soil gas surveys to determine extent of subsurface volatile organic contamination at additional suspected sources in the area.
2. Geophysical techniques with confirmation borings to determine the extent of the Past Landfill and testing and to characterize hazardous constituents. Borings would be analyzed for EP toxicity parameters, base/neutral extractables, EPA Method 601 and 602 analytes, PCBs, and total phenol.
3. Installation of additional shallow and bedrock wells to confirm the extent of contamination. Water quality samples from all monitoring wells should be analyzed for base/neutral extractables, EPA Method 601 and 602 analytes, PCBs, total lead, total phenol, and field parameters on a quarterly basis.
4. Characterization of WWTP sludge for EP toxicity parameters, PCBs, and phenols.
5. Surface water survey to confirm the extent of seepage inflow and contaminant degradation processes. Parameters to be measured would include field parameters, heavy metals, cations/anions, PCBs, TOX, TOC, and EPA Method 601 and 602 analytes.
6. Characterize the debris and contents of drums observed in the upper reach of the unnamed stream.

6.2.2 INDUSTRIAL FACILITIES, ACTIVE LANDFILL, AND STORMWATER RETENTION BASIN NO. 2 AREA (SITES G2, G5, G8, AND G9) (ZONE 2)

Additional monitoring at the Active Landfill (Site G2) is suggested due to the confirmation of the TCE spill plume extending under the boundaries of the Active Landfill and existence of extensive organic contamination throughout the area from past spills or disposal of solvents. Monitoring of wells near the landfill should be coordinated through development of a Master Plan for water quality in this area of Air Force Plant 6.

Additional monitoring of wells at the Stormwater Retention Basin (Site G5) and analysis of basin influent/effluent samples are necessary due to the confirmation of organics in several of the upgradient monitoring wells. Downward migration of TCE from past soil contamination is still occurring as well as migration from more recent sources of contamination (Bldg. B-96 Complex--Site G8). To ascertain the extent of any offsite migration, offsite monitoring wells should be installed. Basin influent and effluent samples should be collected in association with National Pollutant Discharge Elimination System (NPDES) permit monitoring. Aeration should continue as a volatile organic treatment process. Additional treatment should be considered.

Samples from monitoring wells and basin water should be analyzed for the following parameters: pH, conductivity, EPA Method 601 and 602 analytes, PCBs, total lead, total phenol, TOC, and TOX. Regular monitoring for basic ground water quality indicators should continue. This monitoring should be coordinated with a Master Plan for sampling throughout this hydrologic management area.

High concentrations of TCE (38,000 ug/l) and 1,2-dichloroethylene (1,500 ug/l) were found in monitoring Well G5-5 located downgradient of Bldg. B-96L and the empty drum storage area (Bldg. B-96 Complex--Site G8). The unidentified source of this organic contamination should be located. An intensive hydrogeological investigation is needed, including additional monitoring wells, an OVA survey, and possibly soil

gas sampling. The suspected source is the empty drum storage area or the accumulated past wastes disposal area as indicated in the Phase I Records Search (CH2M Hill, 1984). Additionally, soil samples should be analyzed by an EP toxicity test.

The following parameters should be included in the sampling program: base/neutral extractables, pH, specific conductivity, EPA Methods 601 and 602 analytes, PCBs, TOC, and TOX. This site should also be included in a Master Plan to coordinate ground-water monitoring in both this hydrogeologic management area and throughout Air Force Plant 6.

Additional monitoring is required at all wells in the identified plume zone of the TCE Spill at B-76 (Site G9). Isolated wells indicate other sources of minor organic contamination which need to be confirmed and the extent of contamination identified. The same analytical parameters for Site G8 (Bldg. B-96 Complex) are recommended for all the monitoring wells near this plume. Coordination between RCRA monitoring requirements and a Master Plan for ground water monitoring must be implemented.

6.2.3 B-58 WING TANK SEAL TEST FACILITY (SITE G15) (ZONE 3)

Installation and monitoring are suggested for shallow and bedrock downgradient monitoring wells across South Cobb Dr. to determine the potential for offsite migration of organic contamination. In addition, a soil gas testing survey may be used to identify the source of confirmed TCA at MW7 and define the extent of subsurface contamination. The surface topography indicates a complex downgradient flow pattern that has not been sufficiently defined. The following parameters are recommended for sample analyses: pH, specific conductivity, EPA Method 601 and 602 analyte, PCBs, TOX, and oil and grease.

6.2.4 INDUSTRIAL WASTE TREATMENT FACILITY (SITES G6 AND G10) (ZONE 4)
Closure of the B-10 Aeration Basin (Site G6) is required under RCRA. Additional data should be collected to determine the extent of subsurface and downgradient contamination to achieve this goal. Organic contamination has been confirmed in the sediments of the B-10 Aeration Basin, in the underdrain, and in the downgradient monitoring wells. Monitoring Well 28 has a TCE concentration of 12,000 ug/l. The hydrologic flow is toward Big Lake on Dobbins AFB. Additional well installation and sampling are required to determine the extent of contaminant migration. The tributary to Big Lake receives surface drainage from the area and may intercept seepage. It should be sampled for possible contamination.

The following parameters are recommended for analyses: base/neutral extractables, pH, specific conductance, EPA Method 601 and 602 analytes, PCBs, total phenols, and EP toxicity heavy metals.

~~Site G10 (JP-5 Fuel Spill No. 2) will~~ be incorporated into the IWTP area monitoring program. According to past records, most of the fuel spill was recovered. However, no data were available to verify that residual contamination does not exist. Soil sampling to confirm adequacy of clean up should be conducted.

The following parameters are recommended for analyses on a monthly basis: pH, specific conductivity, TOX, TOC, and oil and grease. As a precaution for identifying organic contamination, a semiannual priority pollutant scan should be performed consisting of the following parameters: base/neutral extractables, pH, specific conductivity, EPA Method 601 and 602 analytes, and total lead. These sampling efforts should be incorporated into the appropriate segments of the ground water quality Master Plan.

6.2.5 C-5 FLIGHTLINE AREA (SITES G7, G11, G12, G13, G14, AND G16) (ZONE 5)

Closure of the Position 65--C-5 Wash Rack Ponds (Site G7) will be required according to RCRA since these two ponds are unlined and contain the listed hazardous waste methylene chloride among other organics. The aqueous portion should be pumped to the IWTP for processing. A regular monitoring program should be established as the required RCRA ground water monitoring plan and as a check on fuel/gasoline tank spillage and leakage in the Position 65 vicinity. As part of the Remedial Action Management Plan, the sediments should be sampled comprehensively for determination of disposal alternatives.

The following parameters should be analyzed from samples at the adjacent monitoring wells: pH, specific conductivity, EPA Method 601 and 602 analytes, PCBs, total lead, and oil and grease. This should be coordinated with the Master Plan.

Based on previous investigations, record searches, and ESE's soil sampling, the JP-5 Fuel Spill No. 1 (Site G11) has been determined not to be of environmental concern, and no further action is recommended.

Based on monitoring well and surface soil samples, all chromium concentrations are well below drinking water and EP toxicity MCLs at Site G12 (Position 71--Sodium Dichromate Spill). No further monitoring or action is required for chromium at this site. However, MW G12-1 had elevated conductivity (458 umhos/cm) and TOX (240 ug/l) values plus detectable trans-1,2-dichloroethylene (550 ug/l), indicating an organic source of contamination. Additional monitoring is suggested at this time to confirm contamination and to investigate solvent usage in the vicinity.

All G12 wells should be checked for organic contamination by testing for the following parameters: base/neutral extractables, pH, specific conductivity, EPA Method 601 and 602 analytes, total lead, and oil and grease. In addition, the need for installation of additional monitoring

wells should be evaluated. A soil gas survey should be conducted to identify any volatile organic "hot spots" in the area.

Organic contamination was previously detected at Site G13 (Position 58--Fuel/Defuel Station), but current analyses indicate decreasing concentrations and localized contamination. All wells should be monitored quarterly for basic ground water quality parameters (pH, specific conductivity, TOX, TOC, and oil and grease) according to RCRA specifications. Adjacent wells should be tested for organic indicators, pH, and specific conductivity (EPA Methods 601 and 602 analytes and oil and grease) semiannually. This monitoring program should be coordinated with the Master Plan and be included in the UST monitoring program.

A fuel leakage/spillage problem at Site G14 (Position 19--Fuel/Defuel Station) is evident and confirmed by increasing levels of organic contamination in MW18. Hydrostatic testing of fuel tanks and soil gas testing should be performed to locate the source and implement possible remediation. Monitoring of wells and the drainageway be conducted on a monthly basis for the basic ground water indicators and semiannually for organic contamination for the parameters previously designated for Site G13. This monitoring program should be incorporated in a Master Plan.

Isolated pockets of organic contamination have been identified at Site G16 (B-104 Gas Pump Station) by monitoring well analyses, but the sources are unknown. Additional hydrogeological investigation is required to identify the sources of organic contamination. Soil gas sampling may be necessary. Additional monitoring for organics should be on a monthly basis until sources and extent of contamination are known.

The parameters to be tested, oil and grease, TOX, TOC, pH, specific conductivity, total lead, and EPA Method 601 and 602 analytes should be analyzed for on a semiannual basis.

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